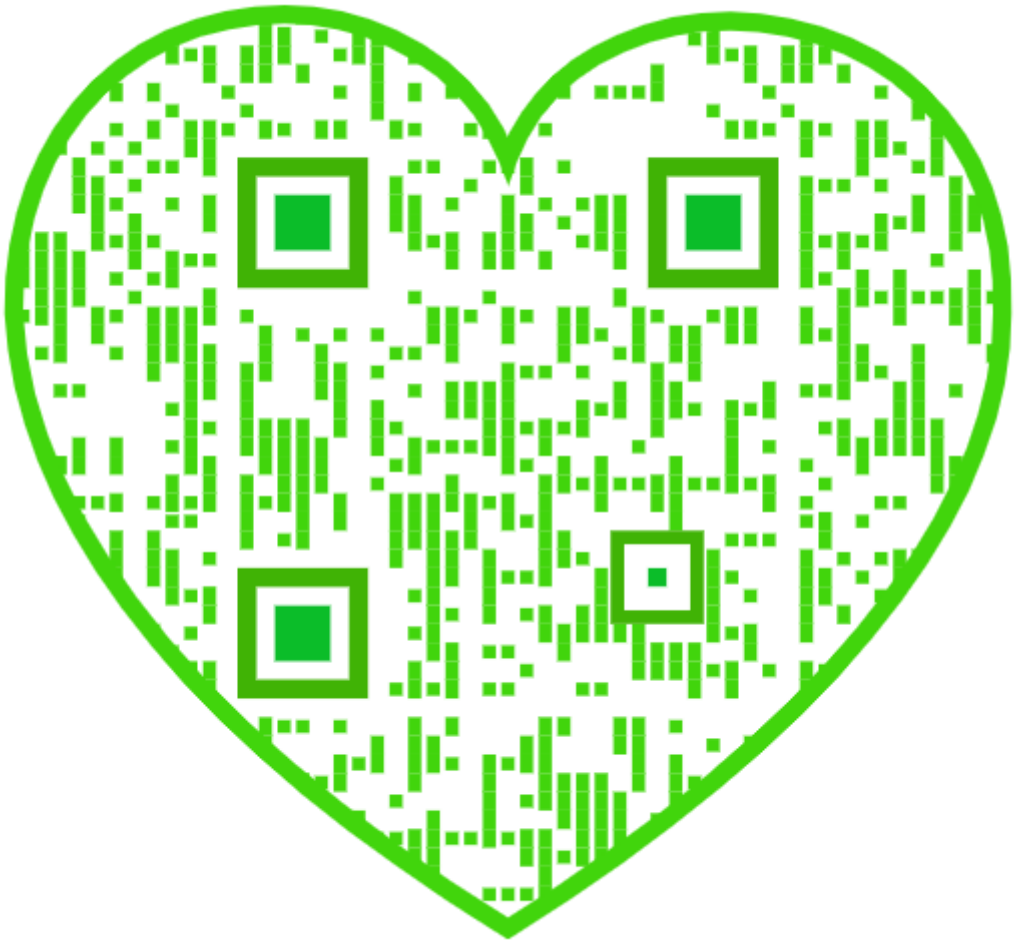

ARITHMETIC BY GRADES

FOR INDUCTIVE TEACHING, DRILLING AND TESTING

BOOK NUMBER SEVEN

Profit and Loss, Commission, Insurance Taxes, Duties, Interest
Banking, Stocks and Bonds, Exchange, Business Accounts
Geometrical Exercises, Ratio and Proportion

PREPARED UNDER THE DIRECTION OF
JOHN T. PRINCE

BOSTON, U.S.A.
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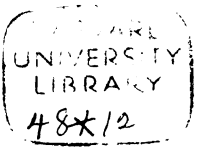

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NOTE TO TEACHERS.

THE attention of teachers is called to the following features of this series of books — features which should be kept in mind as the various subjects are presented.

1. The separation of teachers' and pupils' books, whereby pupils may be taught properly and may not be given too great assistance. Suggestions as to methods of teaching and drilling, as well as the illustrative processes, explanations, rules, and definitions which belong to the teacher to develop analytically are put into the Teachers' Manual, while in the pupils' books are presented only such exercises as are needed for practice.

2. The careful gradation of problems, by which pupils acquire inductively a knowledge of arithmetical relations and principles, and skill in arithmetical processes. This is in recognition of the well-known pedagogical principles of proceeding from the known to the unknown, and from the simple to the complex. It is advised that this plan be kept constantly in mind by the teacher, and that whenever a process is not understood or is not readily performed, the pupils should be taken back to processes which are well known and which can be performed readily, and then should be led forward by easy steps until the desired end is reached.

3. Frequent reviews, and such an arrangement of exercises as will enable pupils to have needed practice in the applications of each principle, first by itself, and afterwards in connection with other principles which have been learned.

4. The large amount of oral work, or work which may be done without the aid of figures. Three objects of Mental Arithmetic are sought in these exercises: (*a*) Illustration of principles and a preparation for written work, (*b*) Development of the logical powers, (*c*) Cultivation of ability to work with large numbers by short processes.

5. The great number and variety of problems. The aim has been to give the *largest number* of problems that will be needed for teaching and for drilling in all grades. For this reason, and because the forms of expression are varied, being taken from many sources, there will be no necessity of giving supplementary drill lessons on the blackboard. Blackboard lessons are objectionable not only on account of a waste of the teachers' time and strength, but also on account of the injury done to pupils' eyes in much reading and copying from the blackboard.

6. Practicalness of work in respect to the character of the problems, and the solution of them. Care has been taken to give problems which are most likely to be met in every-day life, and to give them in a practical form. Many of the miscellaneous review problems were made by mechanics, clerks, accountants, etc., with a view of presenting conditions most likely to occur.

7. The introduction of statistics and facts of physics, astronomy, history, geography, etc., thus enabling pupils to gain incidentally much useful information.

8. The use of drill tables and other devices to save the time of teachers.

In addition to the above features, some of which are distinctively new so far as American text-books are concerned, there is the separation of pupils' exercises for practice into small books somewhat on the lines of gradation in City graded schools. By this arrangement there are gained greater convenience of handling and economy of wear than in the use of a large book which is intended to be used for several years by the same pupil.

In the preceding books of this series, rules and definitions are not called for, and the analysis and explanation of problems are not required to any great extent. In this book all these means of mental discipline are required, and should be insisted upon by the teacher.

The simpler applications of percentage which are given in Book No. 6 will serve as a useful introduction to the more formal study of Profit and Loss, Commission, Interest, etc., which are here presented. While some of the most important business forms are given, it will be found necessary to show to the pupils some papers which are actually used in business, such as bonds with appended coupons, drafts, insurance policies, etc.

In teaching the measurements also it should be understood that geometrical forms must be presented, by the aid of which definitions and simple demonstrations may be derived. For the constructive work required, each pupil should be supplied with a pair of compasses, ruler, and a protractor such as is described in Book No. 6. The subject of Ratio and Proportion is placed after Percentage and Measurements; but if it is thought desirable, it may be taken up immediately after the Review Exercises of Section I.

In the early stages of the study of Arithmetic, correctness in numerical computations is made of primary importance. In the higher grades it ought to be assumed that the mere work of addition, subtraction, multiplication, and division can be done accurately and quickly, and that therefore the logical processes are to be more and more emphasized. Frequently the pupils may be asked to indicate only the steps of analysis that would lead to the correct solution of a given problem. Short processes also, and the indication of processes "on a line," should be constantly encouraged.

The problems given on the last pages of this book will suggest a kind of work that may be done profitably in connection with the elementary science lessons.

For methods of teaching the various subjects, and for answers to problems, see Teachers' Manual, which is designed to accompany all books of the series.

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SECTION I.

Oral Review Exercises.

1. At $\frac{2}{3}¢$ apiece, how many apples can I buy for 50¢?

2. If 40 eggs cost half a dollar, what is the price per dozen?

3. A train of cars goes 20 miles in 40 minutes. What is the rate per hour? At this rate, how long will it take the cars to go a distance of 150 miles?

4. What is a month's rent at the rate of $400 a year?

5. How many cords of wood at $6 a cord will pay for 12 bbl. of flour at $5.25 a barrel?

6. I buy 16 lb. 12 oz. of beef at 20¢ a pound, and 8 bushels of potatoes at $87\frac{1}{2}¢$ a bushel. What change out of a 20-dollar bill?

7. Cost of 1 pk. 3 qt. 1 pt. of berries at 12¢ a quart?

8. How many gill dippers can be filled from $\frac{1}{2}$ pk. of berries?

9. How many cupfuls of coffee in $\frac{1}{2}$ a gallon, if the cup holds $\frac{1}{2}$ a gill? How many, if the cup holds $1\frac{1}{4}$ gills?

10. If $\frac{1}{2}$ a yard of cloth costs 15¢, what will $3\frac{1}{2}$ yards cost at the same rate?

11. If 4 men can do a piece of work in 12 days, in how many days could 6 men do it?

12. At the rate of 3 miles an hour, how many days of 10 hours each will it take a man to walk from New York to Boston, a distance of 240 miles?

13. If 3 lb. of butter last a family 2 days, how long would 30 lb. last? How many pounds would be needed for July?

14. How many house-lots of $\frac{1}{4}$ of an acre each can be made from a field containing 6 acres?

15. Paid $\$\frac{5}{8}$ for 10 lb. of rice. What will 6 lb. cost at the same rate?

16. $\frac{5}{8}$ of John's age is $\frac{2}{3}$ of William's age. John is 16 years old. How old is William?

1. At a cost of $\$\frac{3}{8}$ a rod for fencing, how many rods of road can be fenced for \$48?

2. What should be paid a workman for 4 days and 6 hours' work at \$1.50 a day, 10 hours a day's work?

3. If $4\frac{1}{3}$ doz. eggs cost $\$1\frac{3}{10}$, what will 10 eggs cost?

4. Cost of 6 lb. of mutton at $16\frac{2}{3}¢$ a pound, and 18 lb. of sugar at $5\frac{1}{2}¢$ a pound?

5. What is the cost of $6\frac{7}{8}$ lb. of beef at $22¢$ a pound?

6. How many eggs at $18¢$ a dozen will pay for 18 lb. of brown sugar at $4\frac{1}{2}¢$ a pound?

7. If $8\frac{1}{3}$ doz. eggs cost $\$1\frac{2}{3}$, what cost 1 doz.?

8. How many yards of fencing will it take to inclose a lot of land 100 ft. square?

9. How many yards of carpeting $\frac{2}{3}$ of a yard wide will it take to carpet the floor of a room 10 ft. wide and 12 ft. long?

10. If a rug is 4 yd. long, how wide must it be to contain 48 sq. ft.?

11. What cost $\frac{1}{4}$ of an acre of land at $10¢$ a square foot?

12. At $40¢$ a foot, what will it cost to build a fence around a garden 100 ft. by 50 ft.?

13. How many cupfuls of milk in 2 quarts, each cup holding $\frac{3}{4}$ of a gill?

14. What will 2 reams and 2 quires of paper cost at the rate of $\frac{1}{4}$ of a cent a sheet?

15. If a cubic foot of water weighs 1000 lb., how many pounds of water in a cistern 10 ft. long, 4 ft. wide, the water standing 18 inches deep?

16. If $\frac{3}{4}$ of a barrel of flour cost \$3.60, what will $1\frac{2}{3}$ bbl. cost?

17. How many gallons will a box contain that is 11 in. long, 7 in. wide, and 6 in. deep?

18. How many pounds of cheese at $12\frac{1}{2}¢$ a pound can be bought for \$4? for $75¢$? for \$2.50?

19. If $2\frac{1}{2}$ pk. of potatoes cost $25¢$, what will 1 bu. cost at the same rate? 6 qt.? 2 bu. 1 pk.?

20. How many gallons of ice cream will be sufficient for 60 people, reckoning 1 qt. for 4 people?

1. 18 qt. of berries at 8¢ a quart will pay for how many pounds of sugar at 6¢ a pound?

2. If a horse eats 12 qt. of oats a day, how many bushels shall I have to buy to last 3 horses 6 weeks?

3. What is my ice bill for the month of July, if I took an average of 20 lb. a day, and paid 30¢ a hundred?

4. By spending $1.40 a day, a man spends all his money in 12 days. How many days would his money have lasted him if he had spent 60¢ less every day?

5. If a horse eats 8 qt. of oats a day, how long will 6 bu. last him?

6. Four cans contain the following quantities of milk: 3 gal. 1 qt.; 2 gal. 1 pt.; 3 gal. 1 pt.; 2 gal. 3 qt. How many gallons, etc., in all the cans? How much is it worth at 6¢ a quart?

7. From a cask containing 28½ gal. of vinegar there was sold at one time 26 qt., and at another time 13 gal. 1 qt. What is the remainder worth at 15¢ a gallon?

8. Two men, 80 miles apart, travel towards each other, one at the rate of 2½ miles an hour, and the other at the rate of 3½ miles an hour. In how many hours will they meet, and how far will each travel before meeting?

9. What is the cost of 100 cords of wood at $6.69 a cord?

10. A rectangular field containing 28,750 sq. ft. is 100 ft. wide. How long is it?

11. Find the number of square inches in the surface of a block 1 ft. long, 10 in. wide, and 4 in. high.

12. How many square feet of boards will it take to make a board fence 5 ft. high around a piece of land 4 rd. wide and 100 ft. long?

13. If 2½ doz. eggs cost 35¢, what will 6½ doz. cost?

14. How many yards in a meter, and how many inches over, counting the meter as 39⅜ inches? 1 yard is what part of 1^{m}?

15. How many meters in 15.6^{dm}? in 4860^{cm}? in 8.6^{Km}?

16. How many of your paces, each ½ of a meter in length, will it take to make a hektometer?

17. How many rotations will a wheel 10 ft. in circumference have to make in going ¼ of a mile?

1. How many tiles 5 in. square will cover 10 sq. ft.?

2. How many feet in a mile? in $\frac{1}{4}$ of a mile? in $\frac{3}{8}$ of a mile?

3. How many yards in a mile? in $\frac{3}{4}$ of a mile?

4. What part of a mile is 20 rd.? 1320 ft.? 500 yd.?

5. 6 cubic feet is what part of a cubic yard?

6. How many cords in a pile of wood containing 384 cu. ft.? 672 cu. ft.?

7. How many yards in 8.6 m? in 500 dm? 5800 cm?

8. How many meters in $6\frac{1}{2}$ yd.? in 1 mi.?

9. How many square inches in the surface of a cubical block whose edges are 4 inches long?

10. How many square feet in the surface of a box $3\frac{1}{2}$ ft. long, $2\frac{1}{2}$ ft. wide, and $1\frac{1}{2}$ ft. high?

11. If it takes $5\frac{1}{2}$ yd. of silk 20 in. wide to line a cloak, how many yards 30 in. wide will it take?

12. A cistern having two pipes entering into it can be filled in 2 h. 20 m. How long will it take if another pipe of equal size be used?

13. At the time of death, what was the age of Washington, who was born February 22, 1732, and who died December 14, 1799?

14. The area of a square field is 64 sq. rd. How many yards long is a fence that incloses the field?

15. The cost of 4 boxes of oranges is \$12. How many boxes at the same rate can be bought for \$459?

16. If $\frac{5}{8}$ of a cord of wood costs \$4, what will 2 cords cost?

17. How many pounds in 5 T. 243 lb.?

18. Change 196 T. to hundredweights.

19. $\frac{5}{8}$ cwt. is what part of a ton? 3 cwt.? 750 lb.?

20. Reduce 42,800 pints to bushels.

Find the cost of:

21. 32 bu. potatoes @ \$.30.
22. 40 lb. of coffee @ $\$\frac{3}{8}$.
23. 15 bbl. of apples @ $\$2\frac{1}{3}$.
24. 12 yd. cotton cloth @ $12\frac{1}{2}¢$.
25. 5 gal. molasses @ 15¢.
26. 8 lb. butter @ 28¢.
27. 18 T. coal @ $\$5\frac{1}{3}$.
28. 18 lb. sugar @ $5\frac{5}{8}¢$.

1. If a mechanic received from his employer \$264, and was paid at the rate of \$22 a week, how many weeks had he worked?

2. What is $\frac{2}{3}$ of 24? of 40? of 60? of 50? of 75? of 96?

3. What is $\frac{3}{4}$ of 36? of 62? of 72? of 90? of 120? of 144?

4. What is $\frac{5}{8}$ of 32? of 48? of 70? of 94? of 128? of 192?

5. What part of 48 is 30? is 40? is 18? is 60? is 15?

6. 30 is what part of 40? of 60? of 35? of 150? of 600?

7. 24 is $\frac{2}{3}$ of what number? $\frac{3}{4}$ of what number? $\frac{4}{5}$ of what number?

8. 18 is $\frac{9}{10}$ of what number? $\frac{3}{5}$ of what number? $\frac{9}{11}$ of what number?

9. $\frac{3}{4}$ of 36 is $\frac{1}{2}$ of what number? $\frac{2}{3}$ of what number?

10. 8 is $\frac{4}{5}$ of what number? 18 is what part of 15? $\frac{1}{4}$ is what part of $\frac{1}{2}$? $2\frac{1}{2}$ is what part of 25?

11. What part of 12 is 16? What part of 1 A. is 30 sq. rd.?

12. 16 minutes is what part of 1 hour? of 1 day? of 1 second?

13. What part of 1 lb. Avoirdupois is 1 lb. Troy?

14.

$\frac{2}{3}$ of £2 = ?
$\frac{3}{4}$ of ? = 1 T.
$\frac{7}{8}$ of \$10 = ?
? of 1 bu. = 2 qt. 1 pt.
? of 1 cd. = $2\frac{1}{2}$ cd. ft.

15.

$\frac{5}{8}$ of ? = 20 min. 30 sec.
$\frac{5}{8}$ of 1 sq. mi. = ?
$\frac{5}{8}$ of ? = $3\frac{1}{2}$ cwt.
? of 1° = 40′ 20″.
$\frac{4}{5}$ of ? = 5 pecks.

16.	**17.**	**18.**	**19.**
75% of 40	$87\frac{1}{2}$% of 48	250% of 18	75% of 1000
$12\frac{1}{2}$% of 24	1% of 1230	$18\frac{3}{4}$% of 80	$31\frac{1}{4}$% of 160
150% of 20	$\frac{1}{2}$% of 100	$37\frac{1}{2}$% of 16	$16\frac{2}{3}$% of 120
$6\frac{1}{4}$% of 64	$66\frac{2}{3}$% of 12	$62\frac{1}{2}$% of 24	$33\frac{1}{3}$% of 600
$16\frac{2}{3}$% of 12	4% of 50	$\frac{3}{4}$% of 1000	$1\frac{1}{4}$% of 800

20.	**21.**	**22.**	**23.**
$8\frac{1}{3}$% of 60	15% of \$40	6% of \$12	$12\frac{1}{2}$% of 1 T.
$41\frac{2}{3}$% of 120	8% of \$320	4% of \$75	$37\frac{1}{2}$% of 1 da.
75% of 10	$2\frac{1}{2}$% of \$10,000	3% of £1	75% of 12*s.*
$87\frac{1}{2}$% of 4	200% of \$$\frac{3}{4}$	25% of 3 bu.	$5\frac{1}{2}$% of \$60
$37\frac{1}{2}$% of 50	$\frac{1}{2}$% of \$2	80% of 1 cwt.	125% of 1 A.

1.	2.	3.
$5\frac{1}{4}\%$ of \$300 = ?	? % of 1 T. = 7 cwt.	$62\frac{1}{2}\%$ of ? = \$30
20% of ? = \$50	$37\frac{1}{2}\%$ of ? = 4 qt.	$3\frac{1}{2}\%$ of 600 = ?
? % of \$40 = \$8	$12\frac{1}{2}\%$ of 1 bu. = ?	45% of \$50 = ?
25% of 1 mi. = ?	? % of \$400 = \$25	? % of \$90 = \$100
150% of ? = 75 lb.	75% of ? = \$1.50	$2\frac{1}{2}\%$ of ? = \$5

4. What number increased by 20% of itself equals 500?

5. What number diminished by $12\frac{1}{2}\%$ of itself equals 4?

6. What number diminished by 10% of itself equals 60?

7. What number increased by 100% of itself equals $3\frac{1}{2}$?

8. Bought a carriage for \$125, which was $\frac{5}{9}$ of what my horse cost. What did I pay for both?

9. What date is 8 mo. from to-day? 6 mo. 15 da. from September 20? 9 mo. 18 da. from November 14?

10. What will remain of \$500 after 8% of it is spent? 40%? 75%? $12\frac{1}{2}\%$? $66\frac{2}{3}\%$? $87\frac{1}{2}\%$?

11. Bought a farm for \$5000, and sold it at a gain of 25%. For what did I sell it? What profit was made?

12. Property which ten years ago was valued at \$12,000 has increased in value 250%. Present value?

13. I gained 40% by selling a horse for \$280. Cost?

14. By selling a cow for \$20 less than she cost me, I lost 20%. What was the selling price?

15. By selling shoes at \$2.50 a pair, a merchant made a profit of 25%. What was the cost?

16. John is 18 years old, and his brother James is 16 years old. John's age is what per cent greater than James's? James's age is what per cent less than John's?

17. A house is insured for \$3600 at $\frac{3}{4}\%$ a year. What is the premium for 5 years?

18. A man having lost 20% of his capital, had \$2800 left. What was his capital?

19. At the rate of $4\frac{1}{2}\%$ a year, what is the interest of \$2000 for 2 yr. 3 mo.?

Written Review Exercises.

1. What part of a mile is 50 rd.? 150 yd.? 600 ft.? 18 rd. 4 yd.? 120 rd. 10 ft.? 18 yd. 2 ft.?

2. At \$8 a rod, what will it cost to dig a trench 66 ft. long? 127 yd.? 12 ft. 3 in.? 17 rd. 8 ft. 4 in.?

3. At 25¢ a yard, what will it cost to fence a lot of land 12 rd. 8 ft. long, 6 rd. 10 ft. wide?

4. How much wire in 4 pieces measuring respectively 3 yd. 7 in.; 2 yd. 9 in.; 4 yd. 2 ft. 8 in.? 3 yd. 2 ft.?

5. From a piece of wire 120 yd. long there were cut 3 pieces, measuring 8 yd. 2 ft. 6 in., 14 yd. 10 in., 20 yd. 2 ft. How many yards, etc., remained?

6. A man contracted to build 1 mile of wall, but built only 164 rd. 15 ft. How much remained to be built? If the original contract price was \$1800, what price should be paid for what has been done? If I extend the wall 300 feet farther, what will the whole wall cost me at the rate agreed upon?

7. I wish to cut a piece of wire 80 yd. long into 8 equal pieces. How many yards, etc., in each piece?

8. How many rods, yards, and feet in $\frac{1}{4}$ of a mile? $\frac{3}{8}$ of a mile? $\frac{5}{8}$ of a mile? .9 of a mile?

9. What part (decimal) of a mile is 38 rd.? 850 ft.?

10. What will it cost to fence both sides of a road $\frac{5}{8}$ of a mile long at 80¢ a yard?

11. At \$1.15 a cental, find the value of wheat which fills a box 18 ft. 6 in. long, 6 ft. 4 in. wide, and 6 ft. deep. How much is it worth at 72¢ a bushel?

12. If it requires 6 oz. 4 pwt. of silver to make a cup, how many cups can be made from 62 lb. of silver?

13. How many bushels, etc., of potatoes at 80¢ a bushel will pay for 2 T. 16 cwt. of coal at \$6.50 a ton?

14. What part of an acre is 1800 sq. ft.? 600 sq. yd.? 85 sq. rd.? 6 sq. rd. 80 sq. ft.? 120 sq. rd. 20 sq. yd.?

15. At \$200 an acre, what is 40 sq. rd. of land worth? 90 sq. rd.? 6 sq. rd. 40 sq. yd.? 148 sq. rd. 114 sq. ft.?

1. In a farm there are 120 A. 50 sq. rd. of land, and in an adjoining farm there are 80 A. 130 sq. rd. How much land in both farms together? How much will each cost at \$80 an acre?

2. If a farm containing 68 A. 14 sq. rd. is divided into 6 equal portions, how many acres, etc., in each portion?

3. What is the area in acres, etc., of a rectangular field 182.7 ft. long, 128.86 ft. wide?

4. How long is a 5-acre field that is 260 ft. wide?

5. Find the area of a circle whose diameter is 8 feet.

6. The inner boundary of a circular race course is just half a mile. What is the area of the inclosed space?

7. What will a quarter-section of land cost at \$8.50 an acre?

8. A box 1.5^{m} long, 8.5^{dm} wide, and 75^{cm} deep contains how many liters?

9. A piece of land 190^{m} long and 80^{m} wide is worth what at \$100 per ar?

10. A rectangular field is 28 rd. 8 ft. long, 243 ft. wide. (*a*) How much is it worth at \$200 an acre? (*b*) How much is it worth at the rate of $2\frac{1}{2}¢$ a foot (sq. ft.)? (*c*) How many posts, 9 ft. apart, will be needed for a fence to inclose the field? (*d*) What will the fence cost at $12¢$ a yard? (*e*) At $8\frac{1}{2}¢$ a square yard, what will it cost to make a gravel walk 7 ft. wide lengthwise of the lot? (*f*) How many cubic yards of loam will be needed to cover the lot (not including the walk) 3 in. deep?

11. A courtyard 60 ft. long is covered with 6480 paving-stones, each 8 in. by 6 in. How wide is the courtyard?

12. How many ounces of air in a room 24 ft. long, 20 ft. wide, and 10 ft. 6 in. high, if 100 cu. in. of air weigh 31 grains?

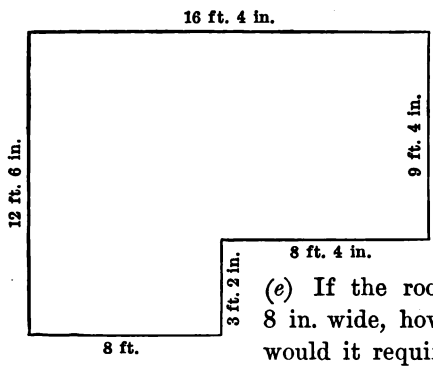
13. How many cubic feet in 10,000 cu. in.? in 48 cu. yd.?

14. How many cubic yards in 300 cu. ft.? 50,000 cu. in.?

15. How many cords in a pile of wood 1 rd. long, 6 ft. 6 in. high, and 4 ft. wide?

16. A school-room having in it 45 pupils is 26 ft. wide and 10 ft. 6 in. high. How long must it be to give 250 cu. ft. of space to each pupil?

1. A room having the following shape and dimensions has walls 9 ft. high. (*a*) How many square feet in the walls? (*b*) How many square feet in the ceiling? (*c*) How many square yards in the floor? (*d*) If the room has 2 doors, each 7 ft. by 4 ft. 6 in., and 6 windows, each 5 ft. 6 in. by 4 ft. 2 in., how much will it cost to plaster the walls and ceiling at 30¢ a square yard? (*e*) If the room were to have mop-boards 8 in. wide, how many square feet of boards would it require? (*f*) What would be the most economical way of laying a carpet 32 in. wide? How many yards less of carpet will it take to lay the carpet in this way than in the other way?



2. Required the cubic contents of a rectangular prism 8 ft. 6 in. long, 4 ft. 3 in. wide, and 2 ft. 9 in. thick.

3. How many cubic feet of air in your school-room? How many cubic feet for each pupil when all are present?

4. How high must wood be piled on a sled 4 ft. long to contain 6 cd. ft., the wood being 4 ft. long?

5. How many cords of wood can be piled in a building 10 ft. 6 in. long, 8 ft. wide, and 9 ft. 6 in. high?

6. How many gallons of water in a cubical cistern 6 ft. long? How many square feet of zinc will it take to line the cistern?

7. A quarter of a section of land is worth what at $3\frac{1}{2}$ an acre? at 75¢ an acre?

8. How many cubic feet of ice are taken from a pond, the ice taken covering half an acre, and being 10 in. thick? If 1 cu. ft. of ice weighs $58\frac{1}{2}$ lb., what is the ice worth at $\frac{1}{4}$¢ a pound?

9. A dealer purchased 600 tons of coal at $5.25 a long ton, paid 75¢ a ton for freight, etc., and sold it for $5.75 a short or common ton. What profit did he make?

1. A town, after a loss of 18%, has 3936 inhabitants. What was its number at first?

2. How many liters in a bushel of wheat?

3. In a school-room measuring 30 ft. 6 in. long, 16 ft. 9 in. wide, and 12 ft. 8 in. high, how many cubic feet of space to each of 56 pupils?

4. At $6 a barrel, what will 88 lb. of flour cost? 44 lb.? 22 lb.? 240 lb.? 784 lb.?

5 What will 100 lb. of flour cost at $5.88 a barrel? at $6 a barrel? at $5.40? at $4.80?

6. If it takes $1\frac{1}{2}$ lb. of flour to make a 10-cent loaf of bread, how many loaves of bread will a barrel make, and what per cent of the price of the bread is the cost of the flour at $6 a barrel?

7. If coal is sold at 20¢ a basket of 25 lb., which costs $6 a ton, what per cent of profit is made? For what would it sell a basket if only 25% were made?

8. My agent bought for me 86 T. of hay at $13.25 a ton. What was his commission at $1\frac{1}{4}$%?

9. A coal-dealer bought 1246 tons of coal, and sold at different times 85.5 tons, $140\frac{3}{4}$ tons, 562.3 tons, and 40.25 tons. How much did he sell, and how much remains?

10. Find the amount of what he sold at $6.25, and estimate the value of the remainder at $5.75.

11. If you put $\frac{1}{5}$ of your potatoes in one bin, $\frac{2}{3}$ in another, and 54 bushels in another, how many bushels of potatoes have you?

12. The product of two numbers is $48\frac{3}{4}$, and one of the numbers is $12\frac{1}{3}$. Required the other.

13. Owning $\frac{2}{5}$ of a factory, Mr. Brown sold $\frac{3}{5}$ of his share for $18,000. What was the value of the entire shop at the same rate?

14. From a piece of cloth measuring $48\frac{3}{4}$ yd., a merchant sold $9\frac{1}{2}$ yd. What part of the whole was sold? What part remained? He sold the $9\frac{1}{2}$ yd. at $1.25, and 3 months later sold the remainder at 85¢ a yard, throwing in $\frac{3}{4}$ of a yard that was damaged. How much did he receive for the whole piece?

1. Make out a bill using the following items; you may be the debtor, and your teacher the creditor: 12 tubs of butter of 60 lb. each at 25¢ a pound, 32 bbl. of apples at $3.25 a barrel, and 16 bbl. of flour at $6.20 a barrel.

2. Find the cost, at 45¢ a cubic yard, of filling in a street which is 1200 ft. long and 72 ft. wide and averages 4.25 ft. below grade.

3. If $281.25 is paid for the use of $2250 for one year, what is the rate of interest?

4. A regiment came out of battle with 400 men. If it went in with 750 men, what per cent were lost?

5. How many rods of fence will be required to inclose a pasture 460 ft. by 532 ft.?

6. How long would a person be in vitiating the air of a room 24 ft. by 18 ft. by 12 ft. 3 in., if he vitiates 40 cu. ft. of air in a minute?

7. Bought a farm of 112 acres at $25.75 an acre, paid $460 for fencing, and sold it for $\frac{1}{8}$ more than the cost. What was my whole gain, and how much did I receive an acre?

8. If $40.50 interest is paid for the use of $900 for one year, what is the rate per cent of interest?

9. How many planks 18 ft. long and 9 in. wide will be needed to floor a room 36 ft. 9 in. long and 27 ft. wide?

10. From a hogshead of molasses 31 gal. 3 qt. 1 pt. were drawn, and sold at 15¢ a quart. How much was received for it? The remainder of the molasses was sold for $4.65. What was the price per gallon? (The hogshead here measured 63 gal.)

11. How many yards of carpeting 27 in. wide will be required for 2 rooms 18 ft. by 26 ft., and one room 20 ft. by 27 ft. 6 in.? Find the cost of the carpet at 1.87\frac{1}{2}$ per yard for largest room, and $1.25 for the other two.

12. A wholesale produce dealer in New York bought 4 T. 8 cwt. 15 lb. 6 oz. of butter during the spring, 2 T. 2 cwt. 5 lb. 4 oz. during the summer, and 5 T. 18 cwt. 80 lb. 12 oz. during the rest of the year. What did he gain during the year if he paid on an average 23¢ per pound for the butter, and sold it for 30¢?

1 A can do in $4\frac{1}{2}$ days a piece of work that requires B 5 days, and C $6\frac{1}{2}$ days to do it. In how many days can they all do it, working together?

2. A lumber dealer bought 460,000 ft. of lumber at \$16.90 per M., and sold it at \$$2\frac{3}{4}$ per C. What did he gain?

3. How long will a quantity of flour last 9 persons, if it lasts 4 persons $12\frac{1}{4}$ months?

4. A farm containing 624 acres was sold for \$11,466. What was the rate per acre?

5. 25 men were employed on a building, each receiving the same wages. If at the end of 14 days they were paid in the aggregate \$962.50, how much did each receive per day?

6. The profits of a grocery business for 1 year were \$3450, which was $\frac{6}{25}$ of the entire capital. What was the capital invested?

7. If sound travels at the rate of 1090 ft. a second, and if a gun be discharged at a distance of $5\frac{1}{4}$ miles, how much time can elapse after seeing the flash before hearing the sound?

8. How many tons of coal can be bought for \$275.50 at \$$5\frac{1}{2}$ for $\frac{2}{3}$ of a ton? What will 8 T. 450 lb. cost?

9. In digging a cellar 48 ft. by 36 ft. 6 in. and 8 ft. 9 in. deep, how many cubic yards of earth must be removed?

10. The Montmorenci River, just before entering the St. Lawrence, makes a fall of 261 ft. What per cent of the fall is the width, if at its brink it measures 20 yards across?

11. The distance from Montreal, by water, to Ha-ha Bay, on the Saguenay, is 380 miles. If the distance to Quebec is $47\frac{7}{19}\%$ of the way, how far is it to Quebec?

12. If the bread made from a barrel of flour weighs 35% more than the flour, what is the weight of bread made from 2 barrels of flour?

13. What is the value of 4 tons of hay at the rate of \$112 for 7 tons? What is the value of 1850 lb.?

14. At \$4.50 per barrel, what will a sack of flour weighing 49 lb. cost? 157 lb. 100 lb.?

15. What will it cost to send 4720 lb. of goods by freight from New York to Baltimore at 95¢ per 100 pounds?

SECTION II.

PERCENTAGE.

Profit and Loss.

1. In buying and selling anything, the rate per cent of gain or loss is always estimated on the cost unless otherwise specified. If I buy a barrel of flour for \$5, and sell it so as to gain 20%, what part of the cost do I gain? What do I gain? What do I sell it for?

2. If my profits amount to $\frac{1}{5}$ of the cost, for what do I sell tea that cost 50¢ a pound? sugar that cost 5¢ a pound? molasses that cost 40¢ a gallon? flour that cost \$5 a barrel? butter that cost 30¢ a pound?

3. What is the selling price of a thing if it cost \$20, and the loss is 25%? if it cost 32¢, and the gain is $6\frac{1}{4}$%? if it cost 40¢, and the loss is $12\frac{1}{2}$%? if it cost \$200, and the gain is $37\frac{1}{2}$%? if it cost \$12,. and the gain is $66\frac{2}{3}$%?

4. If I gain $16\frac{2}{3}$% on the sale of paper which cost me 12¢ a quire, what is the selling price?

$16\frac{2}{3}$% or — of cost = ? = gain.
— cost + — gain = ? = s. p.

5. I buy a farm for \$2000, and sell it at a profit of 32%. For what do I sell the farm?

? = cost.
? = % gain.
? = gain.
? = selling price.

In the same way analyze:

6. I buy oranges at \$2 a hundred. For what shall I sell them a dozen to gain 20%?

7. I gained $33\frac{1}{3}$% on the sale of 840 lb. of meat which cost me \$7.35 a hundredweight. For what did I sell it per pound?

8. Fruit which cost me \$18.40 I was obliged to sell at a loss of 15%. What did I sell it for? For how much should I have sold it if I had gained 15%?

9. Paid \$384 for wheat, and sold it at a gain of 18%. What did I gain? What was the selling price?

1. What part of the cost is gained or lost by buying sugar at 5¢ a pound, and selling it at 6¢ a pound? by buying a house for $2000, and selling it for $2500? by buying a lot of land for $500, and selling it for $400? by buying wheat at 75¢ a bushel, and selling it at 70¢ a bushel? by buying coal at $6 a ton, and selling it at $6.50 a ton? by buying apples at 80¢ a bushel, and selling them at 40¢ a peck? by buying milk at 10¢ a gallon, and selling it at 4¢ a quart?

2. Find the per cent of gain or loss in the above transactions.

3. I buy grain at 80¢ a bushel, and sell it at 90¢ a bushel.

? = selling price.
? = cost.
? = gain = ? of cost = —% of cost.

In the same way analyze:

4. If I buy cloth at $2 a yard, and sell it at $2.50 a yard, what per cent do I gain?

5. A horse which I sold for $200 cost me $150. What per cent of gain? What per cent of loss, if sold for $100?

6. I buy potatoes at 45¢ a bushel, and sell them at a profit of 5¢ on a bushel. What is the gain per cent?

7. I buy 860 lb. of sugar at $4½ a hundredweight, and a barrel of kerosene (42 gal.) for $3.60. I sold the sugar at 5¢ a pound, and the kerosene at 10¢ a gallon. Required the per cent of gain on the sugar and on the kerosene.

8. Bought eggs at the rate of 4 for 3 cents, and sold them at the rate of 3 for 4 cents. What was the per cent of gain?

9. If I sell ¾ of my farm for what the whole farm cost me, what is the per cent of gain?

10. I bought a farm of 80 acres of land for $3000, and sold it at a profit of $8.50 an acre. What was the gain per cent?

11. Cloth costing 85¢ a yard was marked $1.05, and it was sold at a reduction of 8¢ from the marked price. What was the gain per cent?

1. A book is sold for \$10, which is $\frac{4}{5}$ of the cost. What is the cost? A barrel of flour is sold for \$4, which is $\frac{4}{5}$ of the cost. What is the cost? If by selling a coat for \$10, $\frac{1}{3}$ of the cost is gained, what part of the cost is \$10? What is the cost? If by selling a cow for \$50, 25% is gained, what is the cost?

2. I sold a house for \$240 less than it cost, thereby losing 12%. What was the cost?

\$240 = $\frac{12}{100}$ of cost.
? = $\frac{1}{100}$ of cost.
? = $\frac{100}{100}$ of cost.

3. I sell a horse for \$360, and thereby gained 20%. What was the cost? What was the gain?

$\frac{100}{100} + \frac{20}{100} = \frac{120}{100}$ = s. p.
\$360 = $\frac{120}{100}$ of cost.
? = $\frac{1}{100}$ of cost.
? = $\frac{100}{100}$ of cost.

In the same way analyze:

4. By selling potatoes at 20¢ a bushel I gained 20%. What was the cost? What was the gain?

5. A man was compelled to sell goods for \$28, at a loss of 30% of the cost. What was the cost?

6. If by selling cloth at 12¢ a yard I gain 15%, what did I pay for a piece measuring 24 yards?

7. A stationer lost 20% by selling paper at 15¢ a quire. What did it cost a ream?

8. What was the cost of goods when a gain of \$8.10 was 9% of the cost?

9. By selling apples at 75¢ a barrel more than they cost, I made a profit of 15%. What was the cost? Selling price?

10. Sugar was sold at $5\frac{1}{2}$¢ a pound at a gain of $12\frac{1}{2}$%. What was the cost per hundredweight?

11. Sold two horses at \$200 each. On one of them I gained 25%, on the other I lost 25%. Did I lose or gain in both transactions, and how much?

12. $\frac{2}{3}$ of a vessel was sold for \$10,000, at a loss of 8%. What was the cost of the entire ship?

13. A man sold a cargo of 1240 bu. of wheat for \$160 less than it cost him, and thereby lost 12%. What did it cost him per bushel?

1. If a man buys goods for $200, and sells them so as to gain 25%, he gains $50, and sells them for $250. If he sells them at a loss of 25%, he loses $50, and sells them for $150. In this statement, $200, the number on which the per cent is computed, is called the *base;* 25, the number of hundredths that is taken of the base, is called the *rate per cent;* $50, the number found by taking a certain per cent of the base, is called the *percentage;* $250, which includes the base and percentage, is called the *amount;* $150, which is the base less the percentage, is called the *difference* or *remainder.* Define the following terms: base; percentage; rate per cent; amount; remainder.

2. In each of the problems given on the last three pages, state what terms are given and what term or terms are to be found.

3. Make a rule for performing all problems in which the cost and rate per cent are given to find the gain or loss.

4. Make a rule for performing problems in which the cost and gain or loss are given to find the rate per cent.

5. Make a rule for performing problems in which the selling price and rate are given to find the cost?

Analyze and explain:

6. A merchant bought paper at $1.60 a ream, and sold it at 10¢ a quire. What was the gain or loss per cent?

7. If 240 bu. of corn cost $180, what must it be sold for per bushel to gain 15%?

8. By selling eggs at 18¢ a dozen, 25% is lost. What would be the selling price to gain 25%?

9. Peaches were bought at 80¢ a basket, and sold at a loss of 12½%. If the loss was $7.20, how many baskets were sold?

10. Sold a barrel of apples for $3.60, which was 20% more than they cost me, and they cost me 10% more than the wholesale price. What did they cost me, and what was the wholesale price?

11. A grocer bought 60 lb. of tea at 25¢ a pound, and mixed with it 40 lb. that cost 60¢ a pound. He sold the mixture at 58¢ a pound. Did he make or lose, and what per cent?

1. A real estate broker bought 12 A. of land at \$600 an acre, and sold it in house-lots at $3\frac{1}{2}¢$ a square foot. What was his gain, and what per cent?

2. The price of a single ticket from one town to another is 16 cents. The price of a commutation 100-ride ticket between the same places is \$9.50. What per cent is saved by buying the commutation ticket? What per cent is lost by buying single tickets? If any one holding a commutation ticket were to sell rides at 10 cents a ride, what per cent would he gain on the cost?

3. I buy 1 T. 12 cwt. of oats for \$38, and sell them at $44¢$ a bushel. The cost of freight and cartage is $\frac{1}{4}¢$ a pound. Reckoning 32 lb. to the bushel, what is the per cent of my gain or loss?

4. On one-half of a cargo of wheat which cost \$2800, a merchant lost 10%. For how much must he sell the other half to gain 10% on his investment? What rate per cent did he make on the sale of the second half?

Make up problems from the following items, and supply missing terms:

	Cost.	Selling Price.	Gain or Loss.	Gain or Loss Per Cent.
5.	\$10.00	\$8.00	?	?
6.	\$20.00	\$22.00	?	?
7.	\$40.00	?	?	10
8.	\$25.00	?	\$10.00	?
9.	\$100.00	?	\$4.50	?
10.	?	\$40.00	?	20
11.	?	\$6.00	\$1.00	?
12.	\$50.00	?	\$0.50	?
13.	\$8.40	?	?	150
14.	\$160.00	?	?	$\frac{3}{4}$
15.	?	\$250.00	\$25.00	?
16.	\$464.00	?	?	$2\frac{1}{2}$
17.	?	\$1840.00	?	6
18.	\$160.80	\$120.40	?	?
19.	\$140.00	?	?	$1\frac{3}{4}$
20.	?	\$1000.00	?	$1\frac{1}{2}$

Commission.

1. When a person buys or sells goods for another he is called a commission merchant or some name which means the same thing, as *Agent* or *Correspondent.* We will suppose that John Brown, of Boston, writes to Wm. Smith, of St. Louis, requesting him to buy 200 bbl. of flour at $5 a barrel. Smith is to receive for his trouble $1\frac{1}{2}\%$ per cent of what he pays. What he receives is called his *commission.* Who is the *Principal* in this transaction? Who is the *Agent?* What is paid for the flour? What is Mr. Smith's commission? Is Smith a buying agent or a selling agent in this case? We will suppose that he also sells goods, and receives from James Robinson, of Lynn, a consignment of 500 cases of shoes, which he is commissioned to sell at $90 a case. His commission for selling is $1\frac{1}{2}\%$ of the amount of sale. What does he receive for the shoes? What is his commission? What are the net proceeds of the sale? Who is the consignor in this case? Who is the consignee?

2. Define Principal; Agent; Commission.

3. A commission merchant in Chicago buys 1000 bbl. of flour at $5 a barrel. What is his commission at $1\frac{1}{2}\%$?

4. If I send to a commission merchant $1050 with which to buy flour after deducting his commission of 5%, will he deduct 5% of $1050? $1050 is how many hundredths of the cost of flour? How will you find the cost of flour?

$\frac{1}{100}$ of cost = cost.
$\frac{1}{100}$ of cost = commission.

$\frac{1}{100}$ of cost = amt. sent = $ —.
$\frac{1}{100}$ of cost = $ —.
$\frac{1}{100}$ of cost = $ —.

5. An agent receives $20 for selling goods. If his commission was 2%, for how much did he sell the goods?

$\frac{1}{100}$ of cost = cost.
$\frac{1}{100}$ of cost = commission = $ —.

$\frac{1}{100}$ of cost = $ —.
$\frac{1}{100}$ of cost = $ —.

6. A factor in New Orleans bought cotton for $8000 at $\frac{1}{2}\%$ commission. What was paid for both cotton and commission?

1. In the problems on the last page, state what the base is; the percentage; the rate per cent; the amount; the difference.

2. From processes which you have learned, make a rule for finding the commission; for finding the amount sent; for finding the cost or selling price.

3. A salesman receives 2% of his sales. His sales for one week amounted to $840. Counting 50 weeks in the year, what would he earn in a year at that rate?

4. A real estate broker received $2537.50 for the purchase of land. His commission was 1½% of the amount paid. What was the amount paid?

5. I have remitted to my agent $4000 with which to buy wool after deducting his commission of 1% on purchase and charges. His charges were as follows: cartage, $5; labor, $1.80; storage, $6.40. What does he spend for wool?

6. An auctioneer, on a commission of 5%, sells 18 chairs at $1.12½ apiece, 2 bedsteads at $6.40 apiece, and some crockery for $18.60. What are the net proceeds of the sale?

7. An agent received $32.50 commission for selling goods for $1300. What was the rate of commission?

8. My agent bought for me tea at ¾% commission, receiving $150 for his trouble. He sold the tea at a profit of 12½% on the cost. His commission for selling was 1% of the selling price. How much did I make?

9. My agent has sold goods to the amount of $5840. His charges are: commission, 2½%; cartage and storage, $10.40; and 1% for guaranteeing sales. How much is due me?

10. A merchant buys goods on 60 days' credit, and is allowed 1½% for cash. What can he save on a bill of $1840 by paying cash?

11. Received as net proceeds of a consignment $858, after paying 2½% commission for selling. What was the amount of sales?

12. A commission merchant sold for me at auction a lot of goods to the amount of $10,860. His charges are as follows: commission, 2½%; guarantee, 2½%; advertising, $18.60; labor and cartage, $6.40; storage, $12.50. Required the net proceeds.

Insurance.

1. If I pay $25 to an insurance company to insure my house for $3000 against loss by fire for five years, what will the company do in case the house burns down? What in case the house is partially burned? The paper or contract that the company gives me is called a *policy.* The sum that I pay to insure the house is called the *premium.* The party who insures the house is called the *insurer* or *underwriter.*

2. Define policy; premium; underwriter.

3. There are two kinds of insurance companies: joint stock companies, in which all profits or losses are divided among stockholders; and mutual companies, in which the profits or losses are shared by the policy holders. Read over an insurance policy, and explain all parts of it. Is it issued by a joint stock company or by a mutual company?

4. A house was insured for $3000 at $1\frac{1}{2}\%$. What was the premium?

5. A store worth $8000 was insured for 75% of its value at $\frac{1}{4}\%$ a year for 5 years. What was the premium? If the store should be burned down, what would be the owner's loss?

6. The premium for insuring some furniture at 1% was $15. For what was the furniture insured? $\frac{1}{100} = \$—$. $\frac{1}{100} = \$—$.

7. In each of the above problems give the base, rate, and commission.

8. Give the rule for finding the commission; for finding the amount of policy.

9. A merchant has his goods insured in two places — in one place for $5000 at $1\frac{1}{4}\%$, and in another place for $2000 at $\frac{3}{4}\%$. The policies cost $1 apiece. What was the total cost of insurance?

10. A man 40 years of age takes out a life policy for $5000 at a yearly rate of $94.50. Should his death occur at the age of 65, how much more or less would his widow receive than had been paid in yearly premiums?

11. What was the premium for insuring a cargo of 5680 bushels of grain valued at 90¢ a bushel at $1\frac{1}{4}\%$ on $\frac{3}{4}$ of its value?

1. A company charges \$42.80 for insuring a house for \$6420. What is the rate of insurance?

2. An agent received \$48.40 for insuring a house at $\frac{1}{2}\%$ a year for 5 years. What was the valuation of the house?

3. An agent takes a risk of \$8000 at a premium of $1\frac{3}{4}\%$, and reinsures it at $1\frac{1}{4}\%$. What does he gain?

4. A cargo from Liverpool is insured for £2460 10*s.* at a premium of 2%. What is the premium, the pound sterling being valued at \$4.90?

5. A merchant pays \$40 for insuring his goods for $\frac{2}{3}$ of their value. If the rate of insurance is 2%, what is the value of the goods?

6. A store costing \$8400 is insured for $\frac{2}{3}$ of its value at $\frac{3}{4}\%$ premium. What is the owner's real loss if the store be totally consumed by fire?

7. A ship valued at \$48,000 was insured for $\frac{3}{4}$ of its value at $2\frac{1}{2}\%$ a year. If the ship is lost after 20 years of insurance, what is the total loss to the owners, not counting interest?

8. A picture is insured for \$1020.41, which covers its cost, \$1000, and the premium, \$20.41. What is the rate of insurance?

9. For how much must property worth \$980 be insured at 2% to cover the value of the property and the premium?

10. What amount of insurance must be taken to cover property worth \$2400 and premium of 4%?

11. A merchant shipped a cargo of wheat from New Orleans to Liverpool, and to cover both value of wheat and premium took out a policy for \$24,600 at $2\frac{1}{2}\%$. What was the value of the wheat?

12. A man 45 years of age is insured for \$5000 on the ten year endowment plan at \$66.50 per \$1000. How much more will he receive at the end of ten years than the sum of all the premiums he has paid?

13. A man 40 years of age took out a life policy for \$5000 at the rate of \$28.60 per \$1000. He died at the age of 75. How much more or less than the sum of the annual premiums did his widow receive?

Taxes.

1. When money is needed for public purposes by the State, county, city, or town, it assesses a tax upon individuals or corporations. The property upon which taxes are assessed is of two kinds — real estate or immovable property, and personal estate or movable property. Give examples of real estate; of personal property. A tax on property is assessed at a certain per cent of the estimated value of the property. For example: The town of A needs money (for what?), and assesses a property tax. Its valuation is $2,500,000, and it has to raise on the property $200,000. What is the tax on $1? on $1000? Suppose it can raise by poll tax $2000, what would then have to be raised on the property? How much on $1? on $1000? What officers assess the taxes?

2. Define the following terms: *Real estate; personal property; poll tax; assessors.*

3. The taxes of a certain town are $12.50 on $1000 of valuation. What is the rate per cent of taxation? How much tax on $1?

4. The rate of taxation in a certain town is 14.8 mills on a dollar. What is Mr. Brown's tax, whose property is valued at $6000?

5. A town whose valuation is $1,000,000 raises on its property $12,000. What is the rate of taxation per thousand dollars? How much on a dollar? What is A's tax, whose real estate is valued at $2400, and personal property $1000?

6. A town whose valuation is $2,450,000 raises by taxation $29,200. There are 490 poll tax payers, each taxed $2. What is the rate of taxation? What is the tax of Mr. Smith, who pays a poll tax and who owns a farm valued at $3800, and has personal property amounting to $2500?

7. Make a statement of the method of assessing a tax upon individuals by towns or cities.

8. The amount to be raised by taxation in a certain city is $230,000. If its valuation is $12,500,000, and it raises by poll tax $18,600, what is the tax rate per thousand. What is A. P. Jones & Co.'s tax, whose factory is taxed for $42,500?

1. The tax rate in a certain town is $1\frac{1}{2}\%$. Fill out the following table for the convenience of assessors :

Property.	Tax.	Property.	Tax.	Property.	Tax.	Property.	Tax.
$1	$.015	$10	—	$100	—	$1000	—
2	.03	20	—	200	—	2000	—
3	—	30	—	300	—	3000	—
4	—	40	—	400	—	4000	—
5	—	50	—	500	—	5000	—
6	—	60	—	600	—	6000	—
7	—	70	—	700	—	7000	—
8	—	80	—	800	—	8000	—
9	—	90	—	900	—	9000	—

Find by the above table :

2. A's tax : Real estate, $2500; personal, $1000.
3. B's tax : Personal, $3460; poll, $1.50.
4. C's tax : Real and personal, $8840; poll, $1.50.
5. D's tax : Real estate, $1250.
6. E's tax : Real estate, $4300; personal, $2280.

7. The valuation of taxable property in a city is $16,842,400, and the rate of tax levied is 13.5 mills on a dollar. What will be the net proceeds of the tax, the cost of collection being $1\frac{1}{2}\%$, and 5% of the tax being uncollectible ?

8. A's tax amounts to $69, including his poll tax of $1.50. The rate of taxation is $15 on a thousand. For what is his property assessed ?

9. Ascertain the valuation of the real estate and personal property of your town or city during the last year, the amount raised by taxation, expenses of collection, and amount of taxes not collected. Find the rate, and make a table for the given rate similar to the table in Exercise 1. By the aid of this table find the tax on certain pieces of real estate which you know. For what is a man taxed who pays a tax of $124 ?

Duties.

For the purpose of raising money to meet the expenses of the government, and in some countries for the purpose of protecting certain industries, taxes on imported goods are levied. These taxes are called *customs* or *duties*. The duties are of two kinds: specific duties, which are laid on the quantity of goods; as, for example, 75¢ a ton on bituminous coal; and *ad valorem* duties, which are laid upon the value of the goods in the country from which they are imported; as, for example, 60% on laces. Some goods, as coffee and tea, are free from duty.

1. Name some cities at which goods are imported. These are ports of entry. Where are the duties collected? By whom? Deduction for weight of cask, box, etc., is called *tare*. A statement of the cost of goods in the country from which they are imported is called an *invoice*.

2. Define *ad valorem duty; specific duty; port of entry; custom house; gross weight; net weight; invoice; tare.*

3. A merchant imported 60 sq. yd. of carpets from England, invoiced at £25. The duty was 30¢ a square yard and 40% *ad valorem*. What did the carpet cost him?

4. A lady brought from France 2 dozen pairs of gloves for which she paid 6 fr. a pair. The duty was $2.25 a dozen and 50% *ad valorem*. What did the gloves cost her in United States money, the franc being reckoned as $.193?

5. What was the invoice cost of goods for which $125 was paid, duty being 25% *ad valorem?*

6. A wine merchant imported 40 casks of wine, 54 gal. each, invoiced at $1.60 a gallon. What was the duty at 20% *ad valorem*, allowance for leakage 5%?

7. A merchant imported 325 lb. of knit goods, which cost 6*s.* 9*d.* a pound. What was the duty at 38½¢ a pound and 40% *ad valorem?*

8. The gross cost of some imported glassware was $232; the duty was 60% *ad valorem*. What was the invoice cost of the goods?

9. If the gross cost of some imported goods was $322, freight $10, and the cost in Italy $270, what was the duty?

By the tariff act of 1890 the duty laid upon alcohol was 10% *ad valorem;* cigars, \$2.50 per pound and 25%; glassware, 60%; Brussels carpets, 44¢ per square yard and 40%; straw bonnets, 30%; linen handkerchiefs, 55%; hay, \$4 per ton; hops, 15¢ per pound; laces, 60%; table-knives (costing \$2 to \$3 a dozen), 40¢ per dozen and 30%; bituminous coal, 75¢ a ton; lime, 6¢ per 100 lb.; silk knit goods, 60%; sealskin sacques, 35%; common clay pipes, 15¢ per gross; meerschaum pipes, 70%: macaroni, 2¢ per pound; tea, free; coffee, free; potatoes, 25¢ per bushel; marble statuary, 15%.

1. What is the duty upon laces from Belgium valued at \$1480?

2. From New Brunswick 6840 lb. of hay and 1280 lb. of potatoes were imported. What was the duty?

3. What is the duty upon a piece of statuary imported from Florence, Italy, invoiced at 630 lire, the lire being estimated at 19¼ cents?

4. What is the duty on 500 boxes of cigars weighing 1240 lb., invoiced at \$3.25 a box; tare, 8 oz. a box?

5. A merchant received from England the following: 100 doz. linen handkerchiefs, invoiced at 5*s.* 6*d.* a dozen; 20 doz. table-knives, invoiced at 10*s.* 3*d.* a dozen. What was the duty in United States money, the pound being estimated at \$4.90?

6. What is the duty on 500 gross of clay pipes, 100 meerschaum pipes costing \$2.25 apiece, and 500 lb. of cigars invoiced at \$820?

7. Bought and imported 5 rolls of Brussels carpet costing \$180. If the carpet is 30 in. wide, and there are 48 yd. in each roll, what may I sell it for per yard so as to make a profit upon the gross cost of 25%?

8. What is the duty on 180 tons of coal, 40 tons of lime, and 16 tons of hay? (A ton at the custom house is 2240 lb.)

9. How many pounds of hops are imported, if the duty upon them amounts to \$45?

10. Required the duty on 3½ gross of table-knives at \$27.50.

11. Find the present duty upon various articles, and make problems about their importation and sale.

Miscellaneous Exercises.

1. A real estate broker sold half a section of land at $8.50 an acre, and invested the proceeds in mining stock, after deducting his brokerage of $1\frac{1}{4}\%$ for selling the land and $\frac{1}{4}\%$ for buying the stock. What was his brokerage? How much did he invest in stock?

2. A Minneapolis grain dealer received $3529.20 with which to purchase wheat at 80¢ per bushel, after deducting his commission of 2%. How many bushels of wheat did he buy?

3. What will it cost to insure a building valued at $160,000 for $\frac{3}{4}$ of its value at $\frac{3}{8}\%$, the policy costing $1.50?

4. A. T. Stewart & Co. imported silks, velvets, and plushes to the amount of $450,325 in 1891. If the rate of duty was 90%, how much duty was paid? If the same amount of goods had been brought into the country in 1791, when the rate of duty was $7\frac{1}{2}\%$, what would have been the difference in the charges?

5. The taxes of a certain town in 1892 amounted to $12,000. What was the cost of collecting them at $\frac{1}{2}\%$?

6. A merchant having invested $15,000 in business, lost $33\frac{1}{3}\%$ of it the first year, but gained 45% of the remainder the second year. How much did he gain?

7. An agent sold $2540 worth of furniture, and after deducting 5% for commission and 8% for freight and cartage, sent the remainder to the dealers. How much did they receive?

8. A carload of corn consisting of 8 tons cost $240. To gain 20%, what shall I sell it for per bushel, counting 56 lb. to a bushel?

9. Mr. Brown paid $91, including $1 for policy, of $5000 insurance on his house and $4000 on his barn and stock. What was the rate of insurance?

10. Bought a farm for a certain sum, and after paying $1\frac{3}{4}\%$ of the cost for repairs and improvements and a tax of $1\frac{1}{4}\%$, I sold it for $12,840, which just made up what had been expended. What was its original cost?

11. For what sum must property valued at $9000 be insured at $2\frac{1}{2}\%$ to cover $\frac{2}{3}$ of its value, the premium, and the policy at $2?

1. A house and lot were purchased for $60,000, and sold at a loss of 16%. The money was then so used as to make 18⅔%. How much was gained or lost by the transaction?

2. An agent had a shipment of 500 barrels of flour insured for 85% of its cost, at 2%, paying $28.25 premium. At what price per barrel did he purchase the flour?

3. In the town of Norton a tax of $15,000 is to be assessed. There are 1200 polls to be assessed at $1.50 each, and the taxable property is valued at $3,800,000. What will be the property tax on $1, and how much will my tax be if my taxable property is valued at $13,000, and I pay a poll tax?

4. At the above rate, what will Mr. Robinson's tax be if he is assessed at $8530?

5. An agent bought a quarter-section of land at $12.75 an acre, and charged 3% commission. For how much must it be sold to cover cost and commission, and yield a gain of 37½%?

6. Find the duties paid on the following importations: 325 boxes of Indian River oranges at $4.20 per box at 20% *ad valorem;* 500 lb. raisins at 2½¢ per lb.; 1500 lb. figs at 2¼¢ per pound; 825 boxes lemons at 45¢ per box; and $370 worth of prunes and currants, dried, at 40¢ *ad valorem.*

7. A building in Chicago is insured in 5 companies at $10,000 each at ⅞%, in 4 others for $5000 each at ¾%, and in 2 others for $4500 each at ⅘%. What is the premium? If the building is damaged by fire to the extent of $25,000, what does each company pay?

8. The goods in the above mentioned building are insured as follows: $20,000 each in 3 companies, including policies at $1 each, for $603; $10,000 in 5 companies for $300; and $9000 in 2 companies for $80.00. What is the rate of insurance?

9. A man has a debt of $2763.50 due him, but agrees to accept 70% of it. How much will he receive, if the lawyer retains for his fee 1¾% of what he collects?

10. A sewing-machine agent sells machines for $38 each. If the rate of his commission is 15%, how many must he sell to earn $102.60?

1. $300 insurance was paid on a lot of goods. If the face of the policy was $20,000, what was the rate of insurance?

2. My factor purchased for me in France 15 pieces of silk of 44 yards each at $2.75 a yard, 1280 yards of ribbon at 15¢ per yard, and 35 pieces of lace of 5 yards each at 55¢ a yard. The *ad valorem* duties were respectively 80%, 75%, and 87½%. How much in duties shall I have to pay?

3. At what prices can I sell the above named goods to gain 12½% over cost and duties?

4. At 33 years of age Henry Brown took out a life policy for $20,000 for the benefit of his wife, at the yearly rate of $35.33⅓ per $1000. He died at the age of 53. How much more did his widow receive than had been paid in yearly premiums?

5. A town wishes to build a bridge costing $250,000. The taxable property of this town being $8,000,000, what will be a man's bridge tax who is taxed on $20,000, the levy including 3% for collecting?

6. If property insured for $25,000 at 2½% a year should be burned 12 years after it was first insured, what loss would the insurance company actually sustain?

7. A factor sold goods for $9762.00, and received $173.73, which included a charge for freight and cartage of $27.30. What was his rate of commission?

8. An ocean steamship is insured for $97,500 at ⅞% a voyage. What premium is paid?

9. In Oldtown, A's property is assessed at $2600, B's at $3000, C's at $5400, and D's at $1600. Allowing 5% for collecting, how much tax has each one to pay, if the taxable property in the town is valued at $1,000,000, and a tax of $7500 is called for?

10. What are the duties on 15 pieces of Brussels carpeting of 62 yards each, invoiced at $.87½ a yard, the tariff rates being $.42 per yard specific, and 37½% *ad valorem?*

11. Morton & Co. sell goods at auction for me to the amount of $5750. Their charges are as follows: Commission, 2½%; advertising, $17.50; storage, $8.67. How much is due me?

SECTION III.

PERCENTAGE.

Simple Interest.

1. A borrows of B $200, and keeps it 2 years. He pays B 5% a year for the use of it. How much interest does he pay? Suppose he had kept it only 6 mo., how much interest would he have paid? how much for 3 mo.? for 1 yr. 6 mo.? for 9 mo.?

2. When money is said to be on interest at 6%, it means that it is on interest at 6% a year. What per cent of the principal is the interest of $100 for 3 years at 4%? for 2½ years? for 4 yr. 3 mo.?

3. What is the interest of $600 for 1 yr. 6 mo. at 8%? at 7%? at 9%? at 4½%?

4. What is the interest of $500 at 5% for 1 yr.? for 3 mo.? for 2 mo.? for 1 mo.? for 2 yr. 2 mo.?

5. Find the interest at 4½% of $400 for 2 yr. 6 mo.; for 1 yr. 9 mo.; for 8 mo.; for 3 yr. 2 mo.; for 1 mo.

6. Considering 30 days as a month, as is usually done, what is the interest of $800 for 15 da. at 6%? what for 6 da.? for 12 da.?

Find the interest of:

7. $200 for 1 yr. 3 mo. at 6%; at 8%; at 3½%.
8. $400 at 5% for 2 yr. 9 mo.; for 1 mo.; for 12 da.; for 18 da.
9. $1200 at 3½% for 6 mo.; for 3 mo. 12 da.; for 1 yr. 15 da.
10. $1000 for 1 yr. 3 mo. at 6%; at 4%; at 10%; at 3½%.
11. $800 for 3 yr. 4 mo. at 5%; $900 for 30 da. at 8%.
12. $950 for 2 yr. 1 mo. at 6%; $600 for 12 da. at 6%.
13. $1000 at 6% for 30 da.; for 6 da.; for 8 da.; for 13 da.
14. $700 at 6% for 1 yr. 2 mo. 6 da.; for 2 yr. 1 mo. 3 da.
15. $500 at 4% for 60 da.; for 12 da.; for 1 mo. 8 da.
16. $780 at 9% for 9 mo. 6 da.; for 6 mo. 18 da.; for 1 yr. 24 da.

1. If \$600 is put at interest 2 months at 6%, how many hundredths of the principal will the interest be? How many thousandths of the principal will the interest be in 6 da.? How many thousandths of it in 4 da.? How many thousandths of it in 6 mo. 3 da.?

2. The interest equals what part of the principal for 8 mo. 15 da. at 6%?

3 What part of the principal equals the interest at 6% for 4 mo.? 8 mo.? 30 da.? 6 da.? 2 da.? 14 da.? 28 da.? 15 da.? 17 da.? 13 da.? 2 mo. 16 da.? 3 mo. 20 da.?

At 6%, what part of the principal equals the interest for:

4. 2 yr. 4 mo. 12 da.?
5. 1 yr. 6 mo. 6 da.?
6. 3 yr. 9 da.?
7. 7 mo. 8 da.?
8 1 yr. 2 mo. 9 da.?
9. 1 yr. 7 mo. 12 da.?
10. 8 mo. 10 da.?
11. 1 yr. 18 da.?
12. 7 mo. 10 da.?
13. 2 yr. 3 mo. 1 da.?
14. 1 yr. 14 da.?
15. 7 mo. 14 da.?
16. 3 yr. 6 mo. 11 da.?
17. 4 yr. 1 mo. 7 da.?
18. 1 yr. 6 mo. 19 da.?
19. 4 yr. 7 mo. 24 da.?
20. 2 yr. 1 mo. 16 da.?
21. 3 yr. 9 mo. 21 da.?
22. 6 yr. 17 da.?
23. 2 yr. 11 mo. 19 da.?
24. 1 yr. 9 mo. 28 da.?

Find the interest at 6% of:

25. \$200 for 1 yr. 6 mo. 20 da.
26. \$350 for 2 yr. 18 da.
27. \$728 for 9 mo. 5 da.
28. \$394 for 1 yr. 7 mo. 11 da.
29. \$936 for 3 yr. 2 mo. 17 da.
30. \$723.27 for 6 mo. 17 da.
31. \$384.20 for 1 yr. 16 da.
32. \$504.40 for 3 yr. 7 mo. 8 da.
33. \$632.29 for 11 mo. 27 da.
34. \$142.74 for 2 yr. 4 mo. 3 da.

35. What part must be added to the interest at 6% to find the interest at 7%? at 8%? at 9%? at $7\frac{1}{2}$%? at $8\frac{1}{2}$%? at $10\frac{1}{2}$%?

36. What part must be subtracted from the interest at 6% to find the interest at 4%? 3%? $4\frac{1}{2}$%? $5\frac{1}{2}$%? $2\frac{1}{2}$%? $3\frac{1}{2}$%?

37. Knowing the interest at 6%, how will you find the interest at $4\frac{1}{2}$%? at $7\frac{3}{4}$%? $3\frac{3}{8}$%? $7\frac{2}{3}$%?

38. What will \$350 amount to on interest 3 yr. 6 mo. at 5%?

39. What is the amount of \$275.60 on interest at 4% 3 mo. 16 da.?

Find the interest of :

1. $800 for 3 yr. 4 mo. at 8%.
2. $700 for 2 yr. 3 mo. 12 da. at 7%.
3. $840 for 1 yr. 5 mo. 15 da. at 5%.
4. $638 for 9 mo. 17 da. at 4%.
5. $217 for 1 yr. 6 mo. 11 da. at 9%.
6. $342 for 3 yr. 6 mo. 17 da. at 5½%.
7. $628 for 1 yr. 7 mo. 21 da. at 4½%.
8. $300 from Aug. 5, 1892, to Jan. 18, 1893, at 6%.
9. $380 from Sept. 20, 1891, to Aug. 1, 1892, at 6%.
10. $520.80 from Feb. 19, 1890, to Dec. 2, 1893, at 7%.
11. $83.40 from Dec. 26, 1891, to Jan. 18, 1894, at 5%.
12. $674 from Sept. 13, 1892, to July 21, 1893, at 4½%.
13. $7843 from June 20, 1891, to May 9, 1894, at 3½%.

14. $834.20 put at interest March 9, 1893, will amount to what sum Jan. 5, 1894, at 5% ?

15. October 10, 1890, James Brown bought of Wm. Smith a farm for $2600, paying $850 cash, and giving a three years' note for the balance, bearing interest at 5%, payable semi-annually. When was interest paid, and how much ? When and what was the last payment made ? Suppose the amount owed was secured by mortgage. Exactly what was done ? What papers were passed, and by whom ?

16. December 15, 1891, John Robinson bought a horse of Cyrus Eaton for $225, giving his note, payable on demand, with interest at 5½%. What was paid at the time of settlement, January 1, 1894 ?

17. What is the interest of $800 for 1 year at 8% ? for 1 day, considering 365 days a year ? for 73 days ? for 148 days ?

Find the accurate interest by exact number of days on :

18. $540 from July 1, 1893, to Oct. 1, 1893, at 6%.
19. $750 from Feb. 18, 1893, to Sept. 10, 1893, at 5%.
20. $256.20 from Jan. 12, 1887, to July 1, 1890, at 4%.
21. $78.16 from Sept. 9, 1884, to Aug. 17, 1892, at 5½%.

Problems in Interest.

1. At *one* per cent, how much will \$200 gain in 6 months? At what rate would it gain \$20? \$40? \$35?

2. The interest of \$340 at *one* per cent for 1 yr. 6 mo. is how much? At what rate will it be on interest to gain \$20.40? \$30.60? \$15.30?

3. The interest of \$680 for 2 yr. 3 mo. at *one* per cent is what? At what rate will it be if the interest is \$61.20? if the interest is \$104.75?

4. At what rate per cent must \$450 be on interest 3 months to gain \$6.75? to gain \$5.62½? to gain \$4?

5. If the annual income on an investment of \$1800 is \$81, what is the rate per cent? If the income should be increased \$20 a year, what would be the rate of interest?

Find the rate:

	Principal.	Interest.	Time.
6.	\$480.00	\$9.60	6 mo.
7.	\$750.00	\$25.00	3 mo.
8.	\$400.00	\$58.00	3 yr. 6 mo.
9.	\$860.20	\$75.00	1 yr. 4 mo.

Find the rate:

	Principal.	Interest.	Time.
10.	\$740.00	\$44.40	1 yr.
11.	\$820.00	\$60.00	1 yr. 8 mo.
12.	\$380.60	\$27.40	2 yr. 1 mo.
13.	\$146.50	\$12.50	2 yr. 6 mo.

14. What will \$400 gain at 5% in *one* year? How many years will it take to gain \$60 at the same rate? to gain \$100? to gain \$30? to gain \$5?

15. It will take \$3500 *one* year at 6% to gain \$—. How many years at the same rate will it take to gain \$1050?

16. In what time will it take \$400 to gain \$24 at 5%?

Find the time:

	Principal.	Interest.	Rate.
17.	\$800.00	\$50.00	5%
18.	\$740.00	\$24.00	4%
19.	\$340.20	\$32.40	6%
20.	\$80.60	\$1.60	4½%
21.	\$1284.00	\$100.00	5%
22.	\$458.40	\$78.30	7%

Find the time:

	Principal.	Interest.	Rate.
23.	\$480.00	\$7.20	4½%
24.	\$1080.00	\$124.60	3½%
25.	\$4740.60	\$50.80	5%
26.	\$356.80	\$134.80	8%
27.	\$250.90	\$5.20	6%
28.	\$1740.20	\$240.00	3½%

1. *One* dollar will gain what interest at 5% for 1 yr. 6 mo.? How many dollars at the same time and rate will it take to gain \$7.50? \$75?

2. The interest of *one* dollar for 2 yr. 3 mo. at 4% is \$—. It will take how many dollars at the same time and rate to gain \$50? \$100? \$250?

What principal will gain:

3. \$8.00 in 6 mo. at 6%?
4. \$12.50 in 1 yr. 8 mo. at 5%?
5. \$75.60 in 2 yr. 4 mo. at 4%?
6. \$68.40 in 9 mo. 18 da. at 6%?
7. \$148.00 in 1 yr. 3 mo. 12 da. at 5%?
8. \$17.30 in 3 mo. 11 da. at 4½%?
9. \$567.80 in 3 yr. 20 da. at 5½%?

10. *One* dollar will amount to what in 1 yr. 8 mo. at 6%? How many dollars will it take to amount to \$3.20? to \$108?

What sum of money will amount to:

11. \$4.25 in 1 yr. 3 mo. at 5%?
12. \$17.80 in 2 yr. 6 mo. at 4½%?
13. \$646.35 in 8 mo. 15 da. at 6%?
14. \$1086.20 in 1 yr. 7 mo. at 4%?

Find the missing term or terms:

	Principal.	Rate.	Time.	Interest.	Amount.
15.	\$840.00	3½%	2 yr. 7 mo.	?	?
16.	\$400.00	6%	?	\$12.80	?
17.	\$320.00	?	2 yr. 1 mo. 15 da.	\$30.60	?
18.	?	5%	1 yr. 10 mo. 6 da.	?	\$780.00
19.	\$8450.00	4½%	?	\$250.00	?
20.	\$1500.00	?	3 yr. 17 da.	\$200.00	?
21.	?	4.2%	1 yr. 9 mo.	\$26.50	?
22.	\$280.40	7%	8 mo. 14 da.	?	?
23.	\$1160.40	3%	?	\$320.00	?

1. How long will it take \$80 to amount to \$100 at 5%? at 10%? at 8%?

2. January 1, 1890, \$250 was put at interest. April 13, 1891, it had amounted to \$269.25. What was the rate of interest?

3. If I put \$600 at interest July 20, 1891, at 5%, at what time did it amount to \$650?

4. In what time will any sum double itself at simple interest at 6%? at 4%? at 7%?

5. At what rate will any sum double itself in 20 years at simple interest?

6. If a man's quarterly income is \$450, what is his principal, bearing interest at 5%?

7. A house which cost \$4500 rents for \$380 a year. If the insurance, taxes, and repairs amount to \$150 yearly, what rate of interest does it pay?

8. I borrowed, September 1, 1893, \$400 at 4½% interest. It remained on interest until it amounted to \$460. When was the debt paid?

9. A man placed a certain sum of money on interest at 5% when his son was born. On the son's 18th birthday it had amounted at simple interest to \$1240. What sum was put on interest?

10. Find the date at which the sum of \$500 put at simple interest at 6% January 20, 1893, amounted to \$540.

11. When was \$800 put at interest at 5%, which January 1, 1894, amounted to \$900?

12. Mr. Brown owns stock which pays 7% annually. He receives quarterly \$43.75. What sum is invested?

13. How much must I put at interest at 5% to have a monthly income of \$60? How much to have \$3 a day?

14. A man invests \$3840 so that it yields him at simple interest a monthly income of \$12.80. What is the rate of interest?

15. A man pays \$450 a year rent for a house worth \$6500. Will he gain or lose, and how much, in 10 years, if he borrows money at 5% to buy the house, and the average expense for insurance, taxes, and repairs is 2½% of the cost of the house?

Present Worth and Commercial Discount.

1. If I buy a boat for $103, with the understanding that I may wait 6 months before paying for it, what does the boat really cost me? What would be better for me, to pay $103 in 6 months, or to pay $100 cash down, money being worth 6% ?

$204. Philadelphia, March 1, 1892.

Four months after date I promise to pay to the order of E. S. McMurry & Co., Two Hundred Four Dollars.

Value received.

James Edwards.

2. Who is the maker of the above note? Who is the payee? When is the note due? What sum is due? Is it an interest-bearing note? What sum of money put at interest March 1 at 6% will amount to $204 July 1? What is the real value of the note March 1?

3. What sum of money will amount to $105 in a year at 5% ?

4. Which is worth the more, a note for $102 due in 6 months without interest, or $100 cash, money worth 6% ?

5. James Barnes bought of John Douglas a horse, giving him a note for $212, due in 1 year without interest. If money was worth 6%, what was the note worth at the time of purchase?

6. What is the present worth of a note of $400, due in 90 days without interest, money being worth 6% ?

7. What is the present worth of a note of $350, due in 2 months without interest, money being worth 8% ?

8. What is the present worth of a note of $180.60, due in 4 months without interest, money being worth 5% ?

9. A non-interest bearing note of $1600 is worth what 4 months before it is due, money being worth 4% ?

1. A note of $300, dated January 1, due in 6 months without interest, is worth what March 1, money being worth 6% ?

2. If a debt of $1260 be paid 3 mo. 12 da. before it is due, what deduction should be allowed, current rate of interest 6% ?

3. Bought a farm for $2400, to be paid in 4 months, and sold it immediately for $2500 cash. What did I gain, money being worth 6% ?

4. I have two offers for a house, one of $2000 cash, the other of $2150, due in 8 months. Allowing money to be worth 8%, which is the better offer, and how much ?

5. The general practice in paying notes before they are due is to deduct the interest from time of payment to maturity, thus paying more or less than the true value ?

6. A non-interest bearing note of $800, dated January 1, due in 3 months, was paid March 1, by deducting the interest to maturity at 6%. What was paid ? How much more or less than the real value of the note ? If it had been an interest-bearing note, what sum would have been right to pay ?

7. A note of $680, due in 3 mo. 12 da., was sold at a discount of 1% a month. What sum was received ?

8. A merchant sold a bill of goods amounting to $1200. By a rule of the house the buyer had 60 days to pay the bill. If he chose to pay cash, there would be deducted from the bill the interest for 60 days at 6%. What did he pay in cash ? Did he pay more or less than he would have done if he had given his note ? If the merchant should put at interest what he received, what would it amount to in 4 months, money being worth 6% ?

9. Bought iron for $600 on credit for 4 months. Discount of 2% for cash. What did I pay in cash ?

10. The list price of some books is $30. What is the net price at 25% off ?

11. What is the net price of a bill of goods amounting to $500 list, discount 10% ?

12. A bill of goods invoiced at $760.50 is sold on thirty days at 2% off for cash. What is the discount ?

Partial Payments.

1. I borrow \$100 Jan. 1, 1893. I pay \$50 May 1, 1893, and the remainder Sept. 1, 1893. How long is \$100 on interest? How long is \$50 on interest? What should I have paid May 1 to pay the entire debt, money worth 6%? By paying \$50 of the debt May 1, and the remainder Sept. 1, what should I pay?

\$100. *New York, Jan. 1, 1893.*

For value received, I promise to pay to Eben W. Clark, or order, on demand, One Hundred Dollars, with interest at 6 per cent.

JEREMIAH STIMSON.

2. Copy the above note on a piece of paper, and write the following indorsement on the back:

May 1, 1893. Received \$40.

How much was due May 1, 1893, before the \$40 was paid? How much was due on the same day after the \$40 was paid? How much was due Aug. 1, 1893? If on that day, Aug. 1, Mr. Stimson paid \$20, and waited until Jan. 1, 1894, before settling in full, what would be due?

\$640.25. *Chicago, Sept. 1, 1893.*

For value received, on demand, I promise to pay to the order of Abraham L. Foley, Six Hundred Forty $\frac{25}{100}$ Dollars, with interest at five per cent.

HEZEKIAH GREEN.

Indorsements:

Jan. 1, 1894. Received \$150.
Apr. 19, 1894. " 200.
Oct. 19, 1894. " 100.

3. What was the balance due Jan. 19, 1895?

1. On the fifth of October, 1893, Joseph H. Converse, of St. Paul, Minnesota, gave Isaac L. Spalding his note of hand for $460, to be paid in two years, with interest. He paid $80 Jan. 8, 1894; $120 July 1, 1894; and $50 Feb. 6, 1895. Write the note and indorsements in full. What was due at the maturity of note, the legal rate of interest (7%) to be charged?

2. On the fifth day of October, 1890, I borrowed $400, with the understanding that I should pay the debt in installments of $100 every three months. Reckoning interest at 5%, what was due at the time of the last payment?

3. A note of $600, dated Sept. 15, 1892, had indorsements as follows: Jan. 6, 1893, $180; April 9, 1893, $60.50; Oct. 20, 1893, $30; Feb. 8, 1894, $120. What was due Oct. 1, 1894, at 6% interest?

4. A note of $250, dated July 8, 1893, was indorsed as follows: April 6, 1894, $15; June 1, 1894, $60; Sept. 7, 1894, $40; Jan. 1, 1895, $65. What was due July 8, 1895, interest at 5%?

5. A debt of $300 was due April 1, 1892, and payments were made as follows: June 1, 1892, $50; Oct. 1, 1892, $60; Dec. 1, 1892, $30; Jan. 1, 1893, $40. What was due March 1, 1893, at 6% interest?

6. A note of $450, dated Nov. 16, 1894, and drawing interest at 7%, was indorsed as follows: Jan. 1, 1895, $120; April 8, 1895, $40; July 3, 1895, $50. What was due Sept. 8, 1895?

$800. *New Orleans, La., Mar. 13, 1891.*

On demand, I promise to pay Rubert Haynes, or order, Eight Hundred Dollars, with interest at 6 per cent. Value received.

EDSON T. SHERMAN.

Indorsements: May 10, 1891, $75; Sept. 25, 1891, $350; Jan. 10, 1892, $150; July 8, 1892, $100.

7. What remains due July 31, 1892?

8. The above problems are to be performed by the United States rule. Give the rule.

Compound Interest.

1. I put \$100 on interest for 3 years at 5%; but instead of letting it draw simple interest for this time, I add the interest due at the end of each year to the principal, to form a new principal. The interest at the end of the first year is what? What is the new or second principal? What is the interest on this for the second year? What is the new or third principal? What is the interest on this for the third year? What is the amount due me at the end of the third year? How much more than the first principal? This is the compound interest of \$100 for three years. How much more is this than the simple interest at the same rate and time? How do you account for the difference?

2. What is the compound interest of \$1240 for 2 yr. 6 mo. at 6%? Suppose the interest were compounded semi-annually, what would the compound interest be?

3. What is the amount of \$1000 for 4 yr. 8 mo. at 4½%, interest compounded annually?

4. What is the amount of \$680 for 2 yr. 4 mo. 18 da. at 4%, interest compounded semi-annually?

5. \$200 put into the savings bank January 1, 1895, will amount to what July 1, 1900, interest compounded quarterly at 4%?

6. How much, more or less, is the simple interest of \$1000 for 4 years at 5% than the compound interest of the same for the same time at 4%?

Supply blanks of the following table showing the amount of \$1. by compound interest:

Years.	3 per cent.	4 per cent.	5 per cent.	Years.	3 per cent.	4 per cent.	5 per cent.
1	1.030000	——	——	6	——	——	1.340096
2	1.060900	1.081600	1.102500	7	——	1.315932	——
3	——	1.124864	——	8	1.266770	——	——
4	1.125509	——	1.215506	9	——	1.423312	1.551328
5	——	1.216653	——	10	1.343916	1.480244	——

7. Make and perform five problems by this table.

Annual Interest.

1. When a note reads, "with interest payable annually," the interest due each year is not added to the principal for a new principal, but draws simple interest. For example: I borrow of James Brown \$100, and give him my note promising "annual interest" at 6%. At the end of three years I pay him the interest of \$6.00 for two years + the interest of \$6.00 for one year; that is, the interest due at the end of the first year is on interest two years, and the interest due at the end of the second year is on interest one year. Suppose I pay him compound interest for this time and rate, would the amount be more or less than the annual interest? How much? State the difference between compound interest and annual interest.

2. A note of \$1200 with annual interest at 5% is due 4 years after date. If no interest is paid, what will be due at maturity?

3. What is the amount of \$800 for 4 yr. 3 mo. 18 da. at 4½%, interest payable annually?

\$600. *Boston, Sept. 1, 1884.*

Three years after date I promise to pay Amos Brown or order Six Hundred Dollars with interest payable annually at 6%. Value received.

JAMES ROBINSON.

4. If no interest is paid on this note, what is due Sept. 1, 1885? What is due Sept. 1, 1886? Suppose \$100 had been paid July 1, 1886, how much in justice ought to be deducted from this sum? If no more payments are made, what is due at maturity? If nothing is paid until Nov. 1, 1890, what is due?

5. A note of \$1500 is dated April 4, 1890, and due in 3 years, with interest at 6% payable annually. What is due at maturity, if no payments are made? What is due at maturity, if \$300 is paid Jan. 1, 1892, and \$200 Jan. 1, 1893?

6. A note of \$2800, dated Jan. 9, 1888, and due in 5 years, has the following indorsements: July 20, 1890, \$400; Jan. 1, 1892, \$600. What is due at maturity?

Miscellaneous.

1. What principal gives \$40 interest per month at 5%?

2. In what time will \$6400 at 4½% yield \$25 interest? In what time will it amount to \$10,000?

3. I paid \$450 rent for a house which I afterwards bought for \$5600. I gave \$3000 cash, and a 4½% mortgage for the balance. Supposing money to be worth 4½%, and supposing repairs, insurance, and taxes to be 1¾% of cost, how much per year did I gain or lose by buying the house?

4. In what time will a principal of \$850 at 4½% amount to \$1000? In what time at 6%?

5. If a man borrows \$75, and pays the lender \$80 in a month's time to cancel the debt, what rate of interest does he pay?

6. A note of \$800 is dated Sept. 25, 1872. Indorsements: Jan. 1, 1873, \$100; April 1, \$100; July 1, \$100. What was due Sept. 25, 1873, at 7% interest? (Merchant's rule.)

7. I lent a friend \$640, which he kept 1 yr. 3 mo. Some time afterwards I borrowed of him \$230. How long must I keep it to balance the favor?

8. A farm is offered me for \$4500 cash or \$5000 payable in 2 years. If money is worth 5%, which offer is the cheaper for me?

9. What may I offer for a block of houses which pays \$4860 rent per year, so that I may receive 7½% on the investment?

10. A note of \$1680, dated Sept. 15, 1883, was indorsed as follows: Feb. 9, 1884, \$300; May 1, 1884, \$50; Oct. 20, 1884, \$200. What amount was due Jan. 1, 1885, with interest at 6%?

11. Which is the better investment, and how much: \$12,000 yielding \$240 quarterly, or \$18,600 yielding \$1100 a year?

12. A man at his death left his son, who was 15 yr. 4 mo. 12 da. old, \$2000, to be paid on his 21st birthday, with interest at 6%, compounded semi-annually. What should he receive?

13. A note of \$940, with annual interest at 5%, is due 3 yr. 6 mo. after date. If no interest is paid, what will be due at maturity of note? Give the amount due at simple interest for the given time. Give the amount due at compound interest.

1. Which is the more profitable to buy: flour at \$6.50 a barrel on 9 months' credit, or at \$6.25 on 6 months' credit, money being worth 6%?

2. How much must I invest at 4½% that my income may be \$50 a month? How much that the quarterly income may be \$400?

3. A buys of B a house and lot for \$4000, paying \$1200 cash, and giving a note due in 3 years at 5% for the balance. If \$600 was paid at the end of each year, what was due at maturity of note?

4. Mr. Brown borrows of Mr. Smith \$600 at 5%, paying the interest each year in advance. What rate of interest does he pay?

5. If a man's income is \$800 a year, one-half of his investments being on interest at 5%, and the other half on interest at 5½%, what is the sum invested?

6. Find the amount due October 15, 1896, on \$380, loaned Dec. 1, 1893, interest compounded semi-annually at 5½%.

7. How much must I invest at 3½% to yield an income of 50¢ a day throughout the year?

8. Bought 750 lb. of tacks, the list price being 12¢ a pound, with discount at 25% and 10%. Sold them at 10¢ a pound on 60 days' credit. Reckoning money as worth 6%, what was my profit?

9. If after a discount from list price of 25%, rivets sell for 12¢ a pound, what is the list price? If after a discount of 33⅓% and 10% they sell for 10⅘¢ a pound, what is the list price?

10. In what time will any sum double itself at 4½% simple interest? at 8½%?

11. If on Jan. 8 I buy goods to the amount of \$560.28; March 20, goods to the amount of \$380.60; and July 6, goods to the amount of \$482.30, how much must I pay Oct. 1, with interest added at 5%?

12. What sum of money put at interest at 4% will amount to \$519,168 in 2 years, the interest being compounded annually?

13. What sum of money must I put in the bank, where interest is compounded semi-annually at 4%, to amount to \$1000 in 3 years?

14. The list price of certain goods is \$450. What is the selling price at 20, 10, and 5 off?

SECTION IV.

PERCENTAGE.

Banking.

Banks, like railroads and other corporations, are chartered institutions. They are organized for the purpose of furnishing a safe place of deposit for money, exchanging money, borrowing and lending money, issuing notes for circulation, and collecting money on notes and drafts.

Savings Banks are usually carried on in the interest of persons of moderate means, paying from three to six per cent on deposits. They begin to pay interest at a stated time, and the interest is generally payable every six months. If the interest is not withdrawn when due, it goes on interest as part of a new principal.

1. The following statement is copied from a savings-bank book. Explain each item, and find the amount due Jan. 1, 1887, at 4% interest, compounded semi-annually (Jan. 1 and July 1).

Dr. *Lee Savings Bank in account with James P. Robinson.* *Cr.*

1885.				*1885.*			
Jan. 1	*To Cash deposited,*	*$75*	*00*	*Nov. 20*	*By Cash withdrawn,*	*$100*	*00*
July 1	*do.*	*160*	*00*	*1886.*			
1886.				*Aug. 16*	*do.*	*50*	*00*
Jan. 1	*do.*	*150*	*00*				

2. *National Banks* are organized under the laws of the National Government. What business is done in these banks? What must be done before they can issue bills or notes of their own? How do these notes read? Who are the stockholders? What are their duties and obligations? What officers are chosen, and how? What are their duties? How may one borrow money at a bank?

1. Fill out the following blank, making yourself payee, and Archibald Douglas maker, dating to-day, and giving four months' time. Face of note, $300.

$\$$..... West Dover,..... 18*q*

.....after date, for value

received,.....promise to pay to the order of

.....

.....Dollars.

Payable at the First National Bank of West Dover, Mass.

Due..... .....

2. Suppose the bank requires greater security than is given by this note as it appears, what is to be done? You receive $300, less the interest of $300 for 4 months and 3 days (called days of grace), at whatever per cent the bank discounts notes; let us say 6%. How much money do you receive? Who pays it, and what is taken as security? What does Mr. Douglas have to do, and when? Is what you receive from the bank the real value or true present worth of the note? that is, if you should put at interest what you receive to-day, would it amount to more or less than $300 in 4 months? What is the present worth of the note to-day?

3. If, instead of presenting the note to the bank to-day, you had kept it a month, and presented it then, how much less than $300 would you have received? How much, if kept 3 months?

4. If the note is not paid at maturity, a written notice, called a *protest* is sent by the bank to the indorser. Who is it in this case?

5. Define *proceeds; face of note; maturity of note; bank discount; maker of note; payee; indorser; days of grace.* If the third day of grace falls on Sunday or on a legal holiday, when is this note due?

1. A note of $500, dated March 15, 1890, and due in 2 months, was discounted at date. What were the avails, current rate of discount being 7% ?

2. Find the proceeds of a 3-months' note for $600 without interest, discounted at date at 6%.

What are the proceeds of a note of :

3. $600, payable in 60 da., discounted at 5% at date of note ?
4. $800, payable in 90 da., discounted at 6% at date of note ?
5. $450, payable in 4 mo., disc'd at 7% 2 mo. before maturity ?
6. $300, payable in 3 mo., discounted at 6% 1 mo. after date ?
7. $680, payable in 5 mo., disc'd at 5½% 3 mo. before maturity ?
8. $1280, payable in 90 da., discounted at 6% 35 da. after date ?
9. $184.20, payable in 60 da., discounted at 7% 15 da. after date ?

10. March 20, 1893, Gustavus Brown bought a horse of William Black, giving in payment a note for $350, due in 90 days without interest. Black needed the money, and had the note discounted on the day that the note was dated. If the rate of discount was 7%, what sum was received by Black ? Suppose Black had kept the note until May 1, what would he have received ?

11. A merchant sold goods to the amount of $680, taking his customer's note for that amount, due in 60 days without interest. He immediately had the note discounted at the bank at 5%. What did he receive ?

12. A note of $620, dated Aug. 14, 1893, and payable in 90 days with interest at 5%, was discounted at a bank Sept. 14, 1893, at 7%. When does this note mature ? What is then due ? What does the bank pay for the note ? What would the bank have paid for the note if it had been payable without interest ?

13. A note of $450, dated Nov. 24, 1893, and bearing interest at 5%, was due March 24, 1894. It was discounted at a bank at 6% Jan. 24. What were the avails ? If the payee had waited three months before carrying the note to the bank, what would he have received ?

1. If the bank proceeds of a note of $1, due in 2 months and discounted at 6%, is $.9895, a note of how many dollars will give proceeds of $98.95? A note of how much, discounted for the same time and rate, will yield $1187.40?

2. What must be the face of a note due in 3 months and discounted at a bank at 6% to yield proceeds of $738.37½?

3. For what sum must a note payable in 90 days without interest be drawn to produce $984.50, when discounted at 6%?

4. I desire to get $500 at the bank. For what sum must I make the note, payable in 4 months without interest, rate of discount being 6%?

5. A merchant sold grain for which he received a 90-days' note, which he immediately had discounted at the bank at 6%. The proceeds of the note were $1728.78. What was the face of the note?

6. I bought a bill of goods for $600 on 4 months' credit or 8% discount for cash. If I decide to pay cash, and borrow the money at the bank, for how much must I give my note, rate of discount being 5%? What do I gain by paying cash, money being worth 5%?

7. I wish to borrow $1000 at a bank. For what sum must I give my note, payable in 2 months, rate of discount being 7%?

Make and perform problems from the following:

	Face of Note.	Term of Discount.	Rate.	Bank Discount.	Proceeds.
8.	$600	4 mo.	4%	——	——
9.	——	3 mo.	5%	——	$600
10.	——	60 da.	6%	$21	——
11.	$1260	30 da.	5½%	——	——
12.	——	2 mo.	8%	——	$340
13.	——	1 mo.	4½%	$2.475	——
14.	$426.30	90 da.	5%	——	——

15. Mr. Brown bought a bill of goods amounting to $400 on 2 months' credit. Being offered 5% off for cash, he borrowed the money at a bank which discounted his note at 6%. How much did he save?

1. Besides discounting notes, banks receive money on deposit, for which a small rate of interest is sometimes allowed. Suppose you wished to deposit, on the first day of last month, $150 in cash, $75 in checks, and 2 coupons of U. P. R. R. at $40 each, Nos. 14,864 and 14,865; and 15 days later you drew out $80 in cash, having given a check on the same day for $50, to the order of James Smith. Fill out the following blanks that were needed for these purposes. What is done with the deposit slip? What with the check?

DEPOSITED BY

.....

AT THE

Emporia National Bank.

..... 18

Bills,			
Specie,			
Check on	*Bank,*		
Coupons,			

$..... Emporia, ... 189

Emporia National Bank.

Pay to the order of .....

..... 100 Dollars.

No..... .....

1. Jacob Brown's deposit in the bank July 1 is $480. He deposits July 15, $300; Aug. 20, $400. He gave checks July 10 for $200 and Aug. 3 for $300. The bank allows 3% interest on daily balances. Find the amount to Brown's credit Sept. 1, filling blanks of the following statement:

Balances.	Time.	
$480 from July 1 to July 10	9 days.	$4320 for 1 day.
—— from July 10 to July 15	——	——
—— from July 15 to Aug. 3	——	——
—— from Aug. 3 to Aug. 20	——	——

2. Wm. P. Scott deposited, April 18, $250; April 30, $380; May 3, $220; May 10, 360; May 17, $410; May 24, $180. He withdrew, April 25, $200; May 15, $500; May 30, $300. What was the amount to Scott's credit June 1, allowance of 4% interest on daily balances?

3. *Co-operative Banks* or *Loan Associations* receive deposits at stated times, and lend money for building and other purposes to members or stockholders. The amount paid in by stockholders, generally $1 a month on each share, constitutes the capital of the bank. The profits of the bank or association are derived from interest of money loaned, from premiums paid for the privilege of securing a loan, and from fines exacted from members who do not pay their dues at the appointed time. The plans of operation vary much in the different sections of the country, both as to State supervision and modes of making loans.

4. Get from the nearest co-operative bank a copy of the rules governing its operation, and make problems to find the cost of stock, the present value of shares, the amount of premium, what rate of interest is paid investors, and what rate of interest borrowers must pay. From the rules of the association find answers to the following questions: What laws govern the establishment and maintenance of the association? What constitutes the capital? Who are the stockholders? How much are the dues, and when paid? By what plan are loans made? What rate of interest?

Stocks and Bonds.

1. Three partners in a manufacturing business decide for certain reasons to form a stock company. They decide that their business, including building, tools, stock, etc., is worth $60,000. The charter which they get states that the capital of the corporation is that amount, and that there are to be 1200 shares. What is the value of each share? They have at first an equal interest in the business, and after organizing by making themselves a board of directors and choosing a president, secretary, and treasurer, they decide to sell 300 shares (keeping 300 shares apiece for themselves) and to issue certificates like this :

ADAMS MANUFACTURING COMPANY,

Springdale, Delaware.

This Certifies, *That*.....

is entitled to .....*Shares in the Capital Stock of the*

ADAMS MANUFACTURING COMPANY,

Transferable only on the books of the Company, in person or by attorney, upon the surrender of this Certificate.

In Witness Whereof, *The seal of said Company is hereunto affixed.*

Capital Stock, $60,000. Shares, $50 each.

Springdale, Delaware,.....*18*

GEO. K. ADAMS, Treas. *A. L. SAMPSON, Pres't.*

2. Suppose you buy 20 shares of this stock at par, how will your certificate read? After buying these shares and receiving your certificate, what privileges will you have? Suppose the earnings of the corporation for a year are found to be $4800, how much will that be for each share of stock? What per cent of the original or par value? What will your share of the profits or dividend amount to? What dividend will the president, Mr. Sampson get?

1. After this dividend is declared (see page 49), others want to buy the stock, and are willing to pay more than the par value. Mr. Sampson decides to sell 100 of his shares for $54 apiece. What per cent premium does he get? During the second year business was not so good, the dividend being reduced to 5% of the capital stock. What was the entire dividend? What dividend did Mr. Sampson get? What dividend did you get?

2. At the end of the third year the dividend was passed, and the stock sold at 5% discount. If you sell your shares at this price, what is your loss or gain?

3. What is a corporation or stock company? Name different kinds of corporations. What is the difference between a partnership and a stock company? What is a charter? What is a stock certificate? Who are the shareholders? What is par value? What is premium? What is a dividend?

4. The board of directors of a railroad company decided to extend their road, for the construction of which $100,000 would be needed. The stockholders at a meeting approved the plan, and authorized the directors to borrow the money for a term of twenty years. Notes or bonds were issued, for sale in amounts varying from $100 to $1000, and bearing interest at 5% per annum. Each bond had interest coupons attached, indicating the amount of interest for 6 months. How were these bonds or notes worded? The principal was payable to whom? What was printed on each coupon? How many coupons were attached to each bond? Could the bonds be transferred from one person to another? When would the bonds be likely to sell at or above par? When below par? Suppose at the time of their issue you buy one of the five hundred dollar bonds at 2% premium, what do you have to pay for it? How much interest do you receive every six months? How do you get your interest money? Supposing the interest is paid Januuary 1, and you decide on that day to sell the bond at 1% discount, what sum do you receive? Suppose you decide to sell it March 1, what do you get?

5. What is the difference between stocks and bonds?

Unless otherwise indicated, the par value of shares referred to in the following problems is $100.

1. What do I pay for 10 shares of railroad stock quoted at 108? From a semi-annual dividend of 3%, how much do I get on these shares in a year?

2. What is the cost of 20 shares of C. B. & Q. stock at 110½? If it pays a quarterly dividend of 1¼%, what is my yearly income from this stock?

3. The Boston and Albany Railroad stock, selling at 190½, pays a quarterly dividend of 2%. How many shares must Mr. Brown buy to receive $200 a year? How much must he pay for those shares? What per cent does his investment pay?

4. What is the cost of 160 shares of a manufacturing company's stock at 110% of par value of $25 each? What will be the income on this stock, if the dividends amount to 7½% a year? What rate per cent will the investment pay?

5. What yearly income will an investment in Eastern 6's give? If bought at 113½, what rate per cent will the investment pay?

6. How many shares of stock ($100 each) may be bought for $412 at 103. How many for $9400 at 117½?

7. How many $1000 bonds can be bought for $7480 at 93½?

8. Which is better, and how much per cent: to invest in bonds at 115 which pay 7%, or in stock at 90 which pays 6%?

9. A manufacturing company pays a quarterly dividend of 1½%. How many shares (of $25 each) does a stockholder own who receives $900 a year?

10. How much must I invest in United States 3½'s at 105 to give me an income of $612.50 a year?

11. If I buy 6% bonds at 80, what rate per cent of income do I receive? What rate per cent of income from 5% bonds bought at 80? from 4% bonds bought at 90? from 4½% bonds bought at 80?

12. Which is the better investment: 6% stocks at 108, or 5% bonds at par? 4% bonds at 94, or 5% stocks at 90?

13. How much must I invest in Old Colony 5's, bought at 8½% premium to yield an income of $875 a year?

1. At what rate must 4% bonds be purchased to yield annually 5% of the sum invested? 6% bonds to yield 5% of the sum invested? 8% bonds to yield 6%? 4½% bonds to yield 6%? 3½% bonds to yield 5%?

2. If stocks bought at 80 yield annually 5% of their cost, what is the rate of annual dividend?

3. If bonds bought at 108 yield annually 5⅝% of their cost, what rate of interest do they bear?

4. If 6% bonds yield annually 8% of investment, what is the discount?

5. What is the business of a stock-broker? His commission, called brokerage, for buying and selling stocks and bonds is reckoned upon their par value. Brokerage is variously rated in different parts of the country, but generally it is ⅛% of the par value. This commission is understood in the following problems, unless otherwise specified.

6. What is the cost, including broker's commission, of 60 shares Atch. Top. & S. F. R. R. stock at 27¾?

7. 300 shares Mex. Cen. R. R. stock at 17⅞?

8. 8 one thousand dollar bonds C. B. & Q. 6's at 111¼?

9. 12 one thousand dollar bonds No. Pac. 5's at 48½?

10. 1650 shares M. K. & T. R. R. pref. stock at 15¾?

11. 75 shares Northwestern pref. stock at 133¼?

12. 28 shares Am. Ex. Co. stock at 109½? 140 shares?

13. Which is the better investment: 5% bonds at 88 (brokerage ¾%), or 7% bonds at 110 (brokerage ¼%)?

14. A man is advised to buy either 8 one thousand dollar R. R. 6's at 110, or 90 shares of R. R. stock which pays a semi-annual dividend of 2½%. Assuming that he can buy the stock at par, and that he must pay ⅛% brokerage for buying the bonds, and ¼% for buying the stock, which is the better investment, and how much per cent?

15. I bought stock at 4% discount, and sold it at 2½% premium, paying a brokerage in both cases of ¼%. If my net profits were $120, what was my investment?

Exchange.

1. There are several convenient ways of paying debts due in distant places. Mention all the ways you know. What disadvantage in the payment of debts by a personal check? Another way is to buy at a bank a draft or a cashier's check. Why may this be better than a personal check? By whom else may drafts be issued? Copy the following draft, and explain in full each item.

$480.90 Chicago, Jan. 18, 1893.

Ten days after date pay to the order of Wm. P. Macomber

—— Four Hundred Eighty —— $\frac{90}{100}$ Dollars.

Value received, and charge the same to the account of

James H. Upham.

To Thos. S. Appleton & Co.,
No. 142. Boston, Mass.

2. Who is the Maker or Drawer of the above draft? Who is the Drawee? Who is the Payee? To whom is this first sent? What does this person do with it? How is an "acceptance" made? When, where, by whom, and to whom is the money paid? How and by whom may the draft be indorsed? Who is the holder? How many holders may there be? This draft may have been bought by some one. Explain how. Suppose the premium was 1%, what was the cost of the draft?

3. Sometimes drafts are at a premium and sometimes at a discount. Why? Sometimes the words "At sight" are written before "Pay to," etc. Such a draft is called a sight draft. What is the difference between a sight draft and a time draft?

4. Write a sight draft, and explain each part of it.

1. What is the cost of a sight draft for \$1000 at $1\frac{1}{2}\%$ premium? If this draft had been payable in 60 days after sight, and I had bought it at the bank, should I pay more or less for it than I paid for the sight draft? Why? What should I have to pay for it, three days of grace being allowed, and rate of discount being 6%?

2. What is the cost of a draft for \$1500, payable 90 days after sight, at $\frac{3}{4}\%$ discount, rate of interest 6%?

Find the cost of the following drafts:

3. \$600; premium $1\frac{1}{2}\%$; payable at sight.
4. \$840; discount 1%; payable at sight.
5. \$530; premium $1\frac{1}{4}\%$; payable in 60 days at 6%.
6. \$740; premium $\frac{3}{4}\%$; payable in 90 days at 7%.
7. \$900; discount, $1\frac{3}{4}\%$; payable in 30 days at 6%.
8. \$790; discount $2\frac{1}{4}\%$; payable in 90 days at 5%.

9. I desire to buy as large a sight draft as I can for \$1000, exchange being 1% premium. What is the face of the draft?

$\frac{?}{100}$ = face of draft. $\frac{?}{100}$ = cost of draft = \$1000.
$\frac{?}{100}$ = premium. To find face of draft.

If the draft called for is a time draft (90 days at 6%), how many hundredths of the face would the cost of the draft equal? How would you find the face?

10. How large a 90-day draft can I buy for \$800, premium 1%, interest 6%?

11. What is the face of a sight draft that costs \$600, exchange being at a discount of $1\frac{1}{2}\%$?

12. What is the face of a 60-day draft that costs \$5967, premium $1\frac{1}{2}\%$, interest 6%?

13. What is the face of a 90-day draft that costs \$8000, discount $1\frac{3}{4}\%$, interest 8%?

14. What is the cost of a 30-day draft of \$2000, discount $1\frac{1}{4}\%$, interest 7%?

15. If a 60-day draft for \$600 costs \$620.40, what is the rate of premium, interest 8%?

1. Exchange with foreign countries is computed in the same manner as exchange in this country, except that the currency of one country must be reduced to the currency of the other country, with such allowance as the varying rates of exchange make necessary. Why do the rates of exchange differ from time to time? It is customary to send at different times three drafts instead of one. Why? What provision must be made in wording the draft? Henry Mason wishes to send to Jos. H. Brown, of London, £100. He buys of John Smith & Co. a bill of exchange, of which the following is a copy:

£100. Chicago, Aug. 31, 1893.

1 On demand of this **First** of Exchange, Second and Third of the same tenor and date unpaid, pay to the order of Henry Mason One Hundred Pounds Sterling. Value received, and charge the same to the account of

To Wm. Robinson & Co., London. John Smith & Co.

No. 48.

2. What is paid for the above draft, exchange being $4.88¼? To whom is it sent? What is done with the other duplicates? How do they read? Before sending the draft, what must Mason do? To get the draft cashed, what must Brown do? Sometimes a simpler form of draft is sent, which differs from the ordinary draft or check only by the insertion of the words "Duplicate unpaid" after the words "On demand."

3. What is the cost in Boston of a sight draft on London for £68 10*s*., when exchange is quoted at $4.88½?

4. How large a draft at sight on London can be bought in New York for $1800, when exchange is $4.89½?

Miscellaneous.

1. What is the face of a sight draft on London that can be bought in Philadelphia for \$2860, exchange being \$4.86¾?

2. What must be paid for a sight draft on Paris for 8600 francs, exchange being 5.12 francs to the dollar?

3. What is the cost of a bill of exchange at sight on Berlin for 4600 marks, exchange being at \$.96 per 4 marks?

4. How large a bill of exchange at sight can I buy on Paris for \$2800, exchange being quoted at 5.14 francs to the dollar?

5. What is the cost of a 60-day draft on London for £486 12*s.* 8*d.*, exchange for such drafts being \$4.86½?

6. Mr. Brown sold 6240 bu. wheat @ 65¢, commission 2½%, and directed his agent to invest the proceeds in 6% bonds at 110, brokerage ¼%. How many one hundred dollar bonds were bought, and what surplus in money was returned?

7. What is the market price of U. P. R. R. stock when \$8000 par value of stock costs \$1980, including ¼% brokerage?

8. A holder of \$8400 railroad stock receives \$147 as quarterly dividend. What rate per cent does the stock pay?

9. How much must I invest in a 5% stock which I can buy for 96 in order to receive an annual income of \$600?

10. Find the face of a 60-day note whose proceeds will be \$450 when discounted at 6%.

11. I owe a debt of \$320, which I can meet by giving a note due in 90 days, discounted at 6%. For what sum must I write the note?

12. A man bought a farm for \$3200, and sold it for \$3400. Allowing broker's commission of 1¼% for each transaction, what was the gain or loss?

13. A broker buys 40 shares of stock at 20% premium, charging ¼% brokerage. Would his commission be more or less than this for buying land for the same amount of money, charging the same commission?

14. A note of \$165, dated Jan. 20, and due in 4 months, is discounted March 1 at 7%. What was received? Was this note on interest?

1. A dividend of $2\frac{1}{2}\%$ is declared by a manufacturing company. What should a stockholder receive who owns 340 shares, par value being \$25? If four of such dividends are declared in a year, and the shares are bought at a premium of 25%, what per cent is paid on the investment?

2. I buy a horse for \$300 cash, and sell him immediately for \$100 cash and a note for \$250, due in 4 months without interest. On the day of sale I get the note discounted at a bank at 6%. What per cent do I gain?

3. A note of \$800, due in 3 months without interest, is discounted at date at 6%. What are the proceeds? What rate of interest does the bank really receive?

4. What rate of interest does a bank receive in discounting a note of \$100 for 9 mo. 24 da. at 7%? at 8%? at 9%? at $4\frac{1}{2}\%$?

5. A man bought a piece of land for \$1800, and sold it for a 6-months' note of \$2200, discounted at a bank at 6%. Allowing nothing for broker's commission, what per cent of profit is made?

6. James Brown, of Boston, owes John Smith, of New Orleans, \$400, and Mr. Smith owes Wm. Robinson & Co., of Chicago, \$300. Mr. Smith draws a sight draft on Mr. Brown in favor of Robinson & Co. for \$300. Write the draft in full, with proper signature and acceptance. What amount is paid on the draft, exchange being at a premium of $1\frac{1}{2}\%$?

7. A note of \$1260, dated January 8, payable in 90 days with interest at 5%, is discounted at a bank March 1 at 6%. What are the proceeds?

8. A note of \$1000, dated September 5, 1893, payable in 9 months with interest at 6%, had an indorsement of \$300, paid December 12. The note was discounted March 5, 1894, at a bank at 7%. What were the proceeds?

9. What sum must I pay for a 3-months' draft for \$680, premium $1\frac{1}{4}\%$, interest 5%?

10. For what sum must a 90-days' note be made which, if discounted at 6% at a bank, yields \$400? For what sum, if the note is made due in 30 days?

Extract from report of sales at Boston Stock Exchange, August 20, 1893:

BONDS.	
1,500 Atchison 4s	69
500 C.B&No 5s	95½
2,000 C.B&Q 7s	112¼
2,100 C.B&Q c 5s	94
6,000 MexCent 4s	44¾
10,000 do	45¼
1,000 NY&NE 6s	103
2,000 OrShLine 6s	89½
RAILROADS.	
70 Atchison	15
150 do	15⅛
6 do	15⅜
250 do	15¼
20 do	15⅜
5 Bos&Albany b5	199
2 do	199½
42 Bos&Maine	136
9 do	136
10 Bos&Prov	240
36 Chi.B&Q	75
22 do	75
100 do	76
10 do	76¼
100 ChicJunc	60
5 Conn River	215
20 Fitchburg pref	74
20 MexCentral	6¼
1 NY.NH&H	193

RAILROADS.	
2 OldColony	173
12 do	172
200 UnionPacific	18
9 WestEnd	51
50 do	51¼
1 do pref	77
LAND CO'S.	
20 WestEnd	11½
200 do	11
10 do	11½
MINING CO'S.	
235 Bos&Mont	17½
4 Cal&Hecla	260
50 Franklin	9¼
40 Quincy	100
5 do	95¼
MISCELLANEOUS.	
20 AmBellTelephone	182
1 do	180
10 NETel	48
22 PullmanPCar	144
96 do	143
17 Westinghouse	17½
200 GenElec b3	40
50 do	39½
50 do	38⅞
5 do	39¼

The rates of commission under which the above sales were made were as follows:

Bonds: Lots of $5000 and over, $\frac{1}{8}\%$ of par value; lots of less than $5000, $\frac{1}{4}\%$. American Bell Telephone: For lots of 50 shares and over, 25¢ per share; for lots of less than 50 shares, 50¢ per share. Calumet & Hecla, 50¢ per share. All other stocks at $10 and over, $12\frac{1}{2}$¢ per share; below $10, and at $5 or more, $6\frac{1}{4}$¢ per share.

1. Number the above sales, and find the cost, including commission, of each lot sold, assuming that the interest from July 1 is to be added on all bonds sold, and that the quotations of stocks indicate the number of dollars for which each share was sold.

2. The par value of West End R. R. was $50, and of the Mining Companies $25. Make quotations indicating per cent of par value.

3. What per cent does each of the above quoted bonds pay?

4. Assuming that B. & A. stock pays 10% dividend and B. & M. pays 8%, which is the better investment?

SECTION V.

BUSINESS ACCOUNTS AND AVERAGE OF PAYMENTS.

1. The following are the receipts and expenditures of a man for a month: Receipts — Mar. 1, on hand, $24.80; salary, $150; Mar. 15, interest on note, $12.50. Expenditures — Mar. 1, James Brown, rent, $25; wife's allowance, $25; Feb. bills for groceries, $16.80; for fish, meat, etc., $19.61. Mar. 11, sundries, $1.20. Mar. 13, book, $1.40. Mar. 18, clothing, $23. Mar. 23, sundries, $2.75; coal, $8.40. Mar. 30, sundries, $4.87.

Rule paper as indicated below, and make out cash account. Balance at end of month, and begin a new account for April.

CASH.

			Dr.		Cr.	
Mar.	*1*	*Amount on hand,*	*$24*	*80*		
"	"	*Salary for February,*	*150*	*00*		
"	"	*Rent of house for February,*			*$25*	*00*

2. Write a cash account and find balance, using the following:

Jan. 1, 1894: Cash on hand, $184.16; p'd rent for Dec., $20. Jan. 6: Rec'd week's salary, $21; p'd for w'k's groceries, $5.16; market supplies, $6.18; misc. exp. for week, $3.12. Jan. 8: Sold for cash 6 doz. eggs @ 32¢. Jan. 9: B't grain, $4.16. Jan. 13: P'd for w'k's groceries, $4.78; m'k't supplies, $5.17; p'd wages of Maggie (2 w'ks), $6; misc. exp. for week, $4.16; rec'd w'k's salary, $21. Jan. 16: Sold 4 doz. eggs @ 33¢. Jan. 17: P'd for clothing, $18. Jan. 20: P'd for w'k's groceries, $3.62; m'k't supplies, $4.75; misc. exp. for week, $2.20; rec'd w'k's salary, $21. Jan. 22: Sold 5 doz. eggs @ 33¢; 2 chickens @ 50¢. Jan. 27: P'd for w'k's groceries, $3.20; m'k't supplies, $5.10; misc. exp. $1.18; rec'd w'k's salary, $21. Jan. 30: sold 23½ lb. chickens @ 21¢.

1. Copy and balance the following ledger account:

DR. HENRY G. WHITNEY. CR.

1894.					1894.				
Jan.	1	To Mdse.,	$191	40	Jan.	1	By Cash,	$150	00
"	4	" "	246	20	"	8	" Mdse.,	186	94
"	8	" "	78	44	"	10	" Cash,	75	00
"	15	" "	93	84	Feb.	1	" Mdse.,	326	97
Feb.	1	" "	465	95	"	7	" "	142	94
"	9	" "	86	90	"	15	" Cash,	250	00
Mar.	1	" "	284	38	Mar.	15	" Mdse.,	187	75
"	14	" "	86	96	"	20	" Cash,	275	00
"	20	" "	365	08	Apr.	3	" Mdse.,	169	43
Apr.	9	" "	86	40					

2. How will you close this account? How will you start a new account with Mr. Whitney? How does the account stand May 1, no interest being charged?

3. In a form similar to the above, write your transactions with John Jones, who sells you goods on account as follows: June 1, $148.20; June 15, $74.89; July 1, $164.75; July 8, $268.42, July 13, $346.48; Aug. 2, $96.48; Aug. 16, $384.64; Aug. 23, $265.57. You pay him cash as follows: June 1, $125; July 20, $250; Aug. 8, $175; Aug. 16, $275. Settlement is made Aug. 30.

4. The above ledger accounts were copied from a sales-book or day-book. Why is such a book useful? Merchants doing a small business may use only a ledger, and put the debit and credit items in the same column, striking a balance whenever any payment is made. In accordance with this plan, rule paper for a ledger, and make proper entries for the following transactions:

L. P. Walker owes you Jan. 1 $18.60. He pays you Jan. 1 $10. You sell him Jan. 3, 10 gal. K. oil @ 11¢; Jan. 5, 2 lb. coffee @ 32¢, and 3½ lb. cheese @ 12¢; Jan. 9, 3 gal. molasses @ 42¢, 1 bbl. flour $5.60. Jan. 9 he pays you $15. Balance the account at the proper times, and record further sales and payments.

Rule, in any form that you have learned, a ledger for the entry of the following transactions, which you as a carpenter are supposed to have with various persons. You will open and keep an account with cash and with various persons mentioned, also with poultry, to see just what profit is made.

Sept. 1, 1893. Cash on hand, $74.80. Due on account from H. L. Bates, $18.60; James Burke, $27.60; Ira S. Nelson, $16.40. You owe on account John Taber, $7.50; Henry Parker, $6.40; Bates & Bond, $14.30. Estimated worth of poultry and eggs on hand, $84.60. Bought of H. L. Bates 1 bu. potatoes 65¢, green corn 25¢; sold Henry Parker 6 doz. eggs @ 25¢; paid cash for rent, $17.50; paid wife's allowance, $15.

Sept. 2. Received cash from Ira S. Nelson, $10; sold for cash 3 chickens @ 65¢; paid Jos. King for week's work, $12; paid John Green for week's work, $9.

Sept. 4. Bought of G. L. Burrage 15 lb. sugar @ 5½¢, 1 lb. coffee 38¢; bought of E. N. Keith 6½ lb. meat @ 18¢.

Sept. 5. Sold Lewis T. Peters 3 doz. eggs @ 26¢; bought of Bates & Bond 2 bu. corn @ 65¢; paid cash for tools, $1.65; charge Amos Spaulding with one-half of contract on house, $140.

Sept. 6. Bought of G. L. Burrage 1 bbl. flour, $5.50; received from H. L. Bates $10 on account; received from James Cheney $3 for repairs.

Sept. 8. Bought of H. L. Bates 6 lb. butter @ 28¢; sold L. T. Peters 4 doz. eggs @ 26¢, and 4 chickens @ 60¢.

Sept. 9. Bought of E. N. Keith 2¼ lb. steak @ 22¢; paid Jos. King week's wages $12, and John Green's wages $9; paid incidental expenses during the week, $1.30.

Sept. 11. Received from Amos Spaulding on account $40; paid G. L. Burrage on account $5, E. N. Keith $5, Bates & Bond $15; received from James Burke on account $15.

Sept. 12. Bought of H. L. Bates 3 cords of wood @ $4.50; bought of G. L. Burrage 4½ lb. cheese @ 11¢.

Sept. 13. Bought of H. L. Bates vegetables, 95¢; bought of G. L. Burrage groceries, $2.16; received cash job, $.75.

Sept. 14. Sold H. Parker 6 chickens @ 60¢, and 6 doz. eggs @ 27¢; received from Parker on account, $5; bought of E. N. Keith 8 lb. meat @ 14¢; bought of Bates & Bond grain, $1.85.

Sept. 15. Bought of H. L. Bates vegetables, $1.34; bought of I. S. Nelson 420 ft. boards @ $24 per M.

Sept. 16. Paid King week's wages, $12. Paid J. Green week's wages, $9; paid during week incidental expenses $2.20; charge for work on Henry Parker's house, $14; received cash from Henry Parker, $7.60.

Sept. 17. Sold L. T. Peters 9 doz. eggs at 27¢; received from Peters on account, $5.

Sept. 18. Bought of G. L. Burrage groceries, 36¢; bought of E. F. Keith 3 lb. meat @ 23¢; received cash job, $1.60; received from J. Taber $5 on account.

Sept. 20. Bought of H. L. Bates vegetables, $1.20; paid Bates on account, $3.

Sept. 21. Paid cash for clothing, $15.60; paid cash for lumber, $14.20; received from A. Spaulding $40 on account.

Sept. 22. Bought of G. L. Burrage groceries, $1.27; sold H. Parker 6 chickens @ 65¢, and 8 doz. eggs @ 28¢.

Sept. 23. Bought of E. N. Keith 6 lb. meat @ 21¢; paid during week incidental expenses $1.75; paid cash for clothing, $4.18; paid King week's wages, $12; paid Green week's wages, $9; charge J. Taber $8.50 for repairs on barn.

Sept. 25. Bought of H. L. Bates vegetables, $1.18; charge H. L. Bates, labor on house, $13.50; sold L. T. Peters 3 chickens @ 60¢.

Sept. 26. Paid E. N. Keith $5 on account.

Sept. 27. Bought of E. N. Keith 2 lb. meat @ 22¢; received from Amos Spaulding on account $50; received for cash job $1.50.

Sept. 28. Bought of G. L. Burrage groceries, 44¢; paid cash for books, $3.50; bought of Bates & Bond grain, $1.15.

Sept. 29. Paid cash for horse hire, $1.75.

Sept. 30. Paid Jos. King $12 and J. Green $9; paid incidental expenses during week, $1.70.

Average of Payments and Accounts.

1. The use of \$1 for how many months is equal to the use of \$2 for 4 mo.? \$3 for 6 mo.? \$50 for 4 mo.?

2. The use of \$3 for how many months is equal to the use of \$6 for 2 months? \$20 for 3 mo.? \$200 for 4 mo.?

3. A owes B \$80; \$50 is due in 2 mo. and the balance in 4 mo. When may the whole be paid without loss to either party?

(The use of \$50 for 2 mo. and \$30 for 4 mo. is the same as the use of \$1 for how many months? of \$80?)

4. Thomas Jones sold a horse to Isaac Brown upon the following terms: \$200 cash, \$100 to be paid in 3 months, \$100 to be paid in 5 mo. When may the whole sum be equitably paid?

5. I bought a bill of goods amounting to \$1600, payable as follows: \$400 in 30 days, \$400 in 60 days, remainder in 4 months. What was the average term of credit?

6. H. L. Collamore & Co. sell a bill of goods amounting to \$1260, payable as follows: $\frac{1}{3}$ in 2 mo., $\frac{1}{4}$ in 3 mo., and the balance in 4 mo. When may the whole sum be paid without loss to either party?

7. Sept. 8, 1893, a merchant bought goods as follows: A bill of \$680 payable at time of purchase, a bill of \$840 on 30 days' credit, a bill of \$1220 on 60 days' credit. When may the whole be paid without loss to either party?

8. A holds 2 notes against B, one of \$400 being due June 1, and the other of \$600 due August 1. If B should pay the two notes June 1, he would lose the use of \$600 for how many months? or the use of \$1 for how many months? How many months after June 1 may he pay the whole \$1000, and not lose or gain?

9. A manufacturer bought iron of Washburn & Moen as follows: April 20, \$800 on 2 months' credit; June 5, \$1200 on 1 month's credit. When was each sum due? If the two sums were paid June 20, who suffered a loss? This loss is equal to the use of \$1 for how many days? or the use of \$2000 for how many days? When, therefore, may the \$2000 be paid without loss to either party?

1. James Shepard & Co. sold to Lawrence Vinal goods as follows: Jan. 20, 1889, $400 on 3 months' credit; March 5, 1889, $650 on 3 months' credit; June 16, $500 on 2 months' credit. What was the average time of payment?

2. Find the equated time of maturity of the following:

Worcester, Mass., Oct. 1, 1893.

Joshua Reynolds.

To WILLIAMS BROS., *Dr.*

July 20	*To Mdse., 30 days' credit,*	*$820*	*00*
Aug. 16	*To Mdse., 60 days' credit,*	*640*	*00*
Sept. 14	*To Mdse., 60 days' credit,*	*380*	*00*

3. The Johnson Foundry Company's books show that R. T. Dutton owes the company for merchandise $624.42 due Jan. 18, 1894; $346.18 due Feb. 18; $726.16 due March 1. When shall a note to settle the account be made payable?

4. The following is your account with J. R. Spaulding:

DR. J. R. SPAULDING. CR.

1890.						*1890.*					
June	*1*	*To Mdse., 1 mo.,*	*100*	*00*		*June*	*11*	*Mdse., 1 mo.,*	*$100*	*00*	
"	*21*	" " *1 mo.,*	*50*	*00*							

Selecting the latest date, July 21, as the assumed time of payment, find your loss and your gain in having settlement made at that time. Find whether your loss is more or less than your gain. By how much, reckoning the interest on the number of days you lose or gain the use of $50? If you lose, then he must pay the balance before or after July 21? How many days? When may settlement be made without loss to either party? Suppose you had sold Mr. Spaulding, July 1, goods to the amount of $50, when would the equated time of payment be?

1. Find the equated time for paying the balance of the following account:

DR. JOIIN G. RICHARDS. CR.

1891.					1891.				
Apr.	20	Mdse., 30 da.,	$240	00	May	3	Mdse., 30 da.,	$200	00
May	7	" 60 da.,	160	00	June	18	" 30 da.,	100	00
June	3	" 30 da.,	180	00					

2. When should interest begin on the following account:

DR. H. G. WIIITNEY. CR.

1893.					1893.				
Sept.	2	To Mdse., 30 da.,	$200	00	Sept.	21	By Cash,	$100	00
Oct.	4	" " 60 da.,	300	00	Oct.	11	" Draft, 10 da.,	100	00
Nov.	11	" " 30 da.,	100	00					

3. Find the balance of the following account and the time it becomes due:

DR. JONES & FRENCH. CR.

1887.					1887.				
Jan.	8	To Mdse., 30 da.,	$240	00	Feb.	1	By Cash,	$200	00
Feb.	18	" " 60 da.,	380	00	Mar.	1	" Note, 60 da.,	300	00
Mar.	20	" " 30 da.,	140	00					

4. Find the time at which the balance of the following account should draw interest:

DR. ASA P. TIIOMPSON. CR.

1893.					1893.				
July	3	To Mdse. (net),	$250	00	Sept.	1	By Mdse., 30 da.,	$460	00
Aug.	1	" " 60 da.,	340	00	Oct.	20	" " 60 da.,	380	00
Sept.	5	" " 3 mo.,	200	00	Nov.	1	" " (net),	350	00

1. Find the average of the following ledger account:

DR. ATSATT & BROWN. CR.

1892.					1892.				
Apr.	16	To Mdse., 30 da.,	$230	20	Mar.	1	By Mdse., 3 mo.,	$420	60
May	1	" " 60 da.,	120	40	June	8	" " 3 mo.,	210	40
July	3	" " (net),	304	00	July	10	" " 3 mo.,	350	00
Aug.	1	" Cash,	200	00					

2. Jan. 1, 1894, you sell to James S. Stewart a bill of goods amounting to $246.50, on 60 days' credit; Feb. 20, mdse. amounting to $140.90, on 60 days' credit; April 16, mdse., $340.75, 60 days' credit; May 15, mdse., $125, 60 days' credit. He pays you, March 1, $200; April 1, $100; May 1, $100. Write the account in proper form, and find when Mr. Stewart should pay you the balance.

3. Mr. Brown holds a note of $500 against Mr. Robinson, dated Jan. 15, 1894, and due in 4 months without interest. Mr. Robinson pays $100 March 15, and $100 April 15. When may the balance be paid without loss to either party?

4. I buy a farm, for which I give my note for $2200, dated Jan. 18, 1894, payable in 8 months without interest. April 1, I pay $500, and July 1, $800. When should the balance be paid? If settlement is not made until Jan. 1, 1895, what is due?

5. Jacob Robertson sold to A. L. Clark & Co., Jan. 1, 1879, 1260 lb. stove bolts @ $14\frac{1}{2}¢$, on 2 months' credit; April 16, 860 lb. rivets @ $17\frac{3}{4}¢$, 2 months' credit; May 24, 460 lb. stove bolts @ $14\frac{3}{4}¢$, 2 months' credit. Clark & Co. sent to Robertson, Feb. 1, $100; May 20, $200. Assuming that the above prices of goods are the list prices, and that the net prices are 10 and 5 off, when ought interest to begin on the balance due? Make out ledger account such as Robertson would make. Make out ledger account such as Clark & Co. would make. Make out bill such as Robertson would send on the day that balance is due.

SECTION VI.

GEOMETRICAL EXERCISES AND MEASUREMENTS.

1. A ball, a book, and a pencil are solids. Point out other solids. How many and what dimensions has a solid? What are the boundaries of a solid? Point out various surfaces. How many and what dimensions has a surface? What are the boundaries of a surface? Point out several lines. How many and what dimensions has a line? What are the ends of lines? How many dimensions has a point?

2. Draw a straight line; a broken line; a curved line; a horizontal line; a vertical line; two parallel lines; two parallel vertical lines; two parallel perpendicular lines. Draw two parallel vertical lines of equal length.

3. Draw a straight line* 1 in. long; a line 3 in. long; a line $4\frac{1}{2}$ in. long; a line 1 ft. long; a line 1 yd. long; a line 7 in. long; a line 18 in. long.

4. Draw by a scale of 1 inch to a foot a line 2 ft. long; a line 10 ft. long; a line 1 rd. long.

5. Draw by a scale of $\frac{1}{4}$ of an inch to a foot a line 2 ft. long; a line 8 ft. long; a line 12 ft. long; a line 40 ft. long; a line 4 rd. long; a line 6 ft. 9 in. long.

6. Draw a door of your school-room by a scale of $\frac{1}{2}$ an inch to a foot. Draw the same by a different scale.

7. Draw the floor of your school-room by a scale of $\frac{1}{4}$ of an inch to a foot.

8. Draw a line and divide it into 2 equal parts.

9. Draw a line and divide it into 4 equal parts; into 8 equal parts.

10. Draw by a scale of $\frac{1}{4}$ of an inch to a foot a room 26 ft. long, 16 ft. wide.

* When the word "line" is used in this section, a straight line is meant.

1. Draw a right angle; an acute angle; an obtuse angle.

2. Draw an angle of 90°; 45°; 15°; 30°; 60°.

3. Divide an angle as nearly as you can into 2 equal parts.

4. Divide an angle into 4 equal parts.

5. Draw "by guess" angles of 60°; 40°; 100°; 150°; 20°; 45°; 10°. Measure these angles with protractor, and note the difference, filling out a table like the following:

Angle.	Estimated.	Measured.	Difference.
abc	60°	56°	4° +

6. How many degrees in a right angle + an angle of 35° 30′?

7. Draw two adjacent angles. How many degrees in both together? How many in each?

8. If 4 equal angles lie about a given point, how large are the angles? How large if 6 equal angles so lie? if 8? if 10?

9. How many equal angles, each of 60°, can be drawn about a given point? How many, each of 40°? of 120°? of 36°?

10. What angle is one-third as great as an angle of 38° 30′ 24″?

11. What angle is 6 times as large as an angle of 20° 40′ 30″?

12. Two angles together, one of which is 4 times as large as the other, measure 140° 30′. How large is each?

13. What kind of an angle do the minute and hour-hands form at 9 o'clock? at 3 o'clock? at 12 o'clock?

14. Draw a rectilinear figure; a curvilinear figure.

15. Draw a rectilinear figure having the fewest possible boundaries, and name it.

16. Draw all kinds of plane figures bounded by four straight lines, and name them.

17. Draw polygons having 5, 6, 7, 8, 9, 10, 11, and 12 boundaries, and name them.

18. Draw all kinds of triangles, and name them.

19. By a scale of $\frac{1}{4}$ of an inch to a foot draw a triangle whose sides measure 12 ft., 9 ft., and 16 ft.

1. Can a triangle be drawn whose sides have the following measurements: 2 in., 4 in., 6 in.? What conclusion can you make from this?

2. By experiment, find how many degrees the three angles of a triangle have.

3. If one angle of a right triangle measures 30°, what is the measure of the other angles?

4. Measure and compare the angles of an equilateral triangle.

5. Measure and compare the angles at the base of an isosceles triangle.

6. If the angle at the vertex of an isosceles triangle is an angle of 40°, how large are the angles at the base?

7. Draw three kinds of quadrilaterals, and name them.

8. Draw a parallelogram. How does it differ from other four-sided figures?

9. Measure and compare the opposite angles of a parallelogram.

10. If one of the angles of a parallelogram equals 90°, how large is each of the other angles?

11. If one of the angles of a parallelogram equals 60°, how large is each of the other angles?

12. Draw all kinds of parallelograms. Describe and name them.

13. Draw a square, each of whose sides is 2 in. long; 3 in.; $2\frac{1}{2}$ in.

14. Draw a rhombus, each of two angles being equal to 60°.

15. Draw a rectangle, one of whose sides is 4 in. long and another 2 in. long. What can you say of the opposite sides of a rectangle?

16. Draw by a scale of $\frac{1}{2}$ an inch to a rod a piece of land in the form of a rectangle 9 rods long and 6 rods wide.

17. Draw each kind of parallelogram with diagonals. Measure and compare lines and angles in each. Make a statement of conclusions.

18. Draw a line which represents the altitude of each kind of parallelogram.

19. How many square inches in a square, one of whose sides is 6 in. long? Prove by diagram.

20. How many square inches in a rectangle 8 in. by 4 in.? Prove by diagram.

1. What will 8 rods square of land cost at the rate of $200 an acre?

2. A fence inclosing a square garden is 480 yd. long. How many square feet in the garden?

3. A square piece of land 75 ft. long contains what part of an acre?

4. Draw by some convenient scale a square whose sides are 8 ft. long. Draw by scale a square whose sides are 2 rd. long.

5. Draw by a scale of 1 to 20 a rectangle 60 ft. long and 50 ft. wide. How many square rods in it?

6. By any convenient scale draw a rectangular lot of land which is 45 rods long and 25 rods wide. How many acres in the lot?

7. Draw a plan which will represent a square piece of land having a perimeter of 84 yards.

8. Draw a rectangle $6\frac{1}{2}$ in. long which will contain as much as a square $3\frac{1}{2}$ in. long.

9. A rectangular garden 140 ft. long and 80 ft. wide has a walk 4 ft. wide extending around the garden. There is a walk 3 ft. wide extending lengthwise through the middle of the garden. Draw plan, and estimate the number of square feet in the walks.

10. A meadow is 10 rd. long and 140 ft. wide; through the middle of the meadow lengthwise there is a ditch 5 ft. wide, and across the middle breadthwise there is another ditch of the same width. Draw by a scale of 1 in. to 10 ft. the plan of meadow, and estimate the number of square feet of grass-land.

11. How much hay is taken from the above meadow, reckoning 4 tons to the acre?

12. A piece of land 185 ft. wide must be how long to contain $\frac{3}{4}$ of an acre?

13. A street 40 ft. wide covers 1 A. 48 sq. rd. What is the length of the street?

14. How many planks 12 ft. long, 8 in. wide will it take to lay the floor of a room 14 ft. 9 in. long, 10 ft. 3 in. wide? If the planks are 2 in. thick, how much will they cost at $20 per M., board measure?

1. How many yards of carpet 30 in. wide will it take to carpet a room 14 ft. long, 12 ft. 6 in. wide? In what way should the carpet be laid to avoid cutting or turning under?

2. If the room mentioned in the last example is 8 ft. 6 in. high, what will it cost to paper the room at 30¢ a roll, each roll being 8 yd. long and 18 in. wide? In finding the number of rolls, make no allowance for waste in matching or laying the paper, and make full allowance for 1 door $7\frac{1}{2}$ ft. by $4\frac{1}{2}$ ft., and 3 windows, each $4\frac{1}{2}$ ft. by $3\frac{1}{3}$ ft. Find approximately the amount of waste in laying the paper.

3. Observe how an ordinary box is made, as to the length and width of boards to make the sides, ends, top, and bottom. How many square feet of boards 1 in. thick will it take to make a box 3 ft. long, 2 ft. wide, and 1 ft. high?

4. How many square feet of boards must I carry to the box-maker that he may have 800 sq. ft. after deducting 8% for waste?

5. How many feet of boards $\frac{5}{8}$ of an inch thick will it take to make 400 boxes that are 3 ft. 2 in. long, 1 ft. 6 in. wide, and 1 ft. high, an allowance of 10% to be made for waste? Cost of the boards at $14.80 per M.?

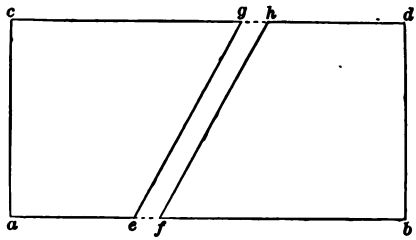
6. A room 16′ 8″ long 12′ 6″ wide, and 9′ 8″ high has 4 windows, each 5′ × 3′ 8″, and 2 doors, each 7′ 6″ × 4′ 6″. Cost of plastering the walls and ceiling at 60¢ per square yard, one-half the area of openings being charged? Cost of papering the walls at 28¢ a roll, a roll of paper being 18 in. wide and 24 ft. long? (Allow 2 rolls for waste in matching.) Cost of carpeting @ 75¢ a yard carpet 27 in. wide, no "breadth" being divided, and no waste in matching? Find the number of square feet of boards that will be required for a double floor and for the mop-boards 9 in. high.

7. Show in any way you can that the area of a parallelogram is equal to the base multiplied by the altitude.

8. What is the area of a lot of land in the form of a rhomboid whose base is 14 rd. and altitude 140 ft.?

9. A piece of land in the form of a rhombus has an altitude of 100 ft., and contains 14,000 sq. ft. What is the length of one side?

1. A rectangular piece of land *abcd* is 800 ft. long and 400 ft. wide. A railroad is run through it obliquely *efgh*, the distance *ef* and *gh* measuring 50 ft. How much land is taken by the railroad company? What is the rest of the land worth at $500 an acre?



2. Show in any way that triangles have one-half the area of parallelograms having the same base and altitude.

3. Show from the facts learned that the area of a triangle is equal to half the product of its base by its altitude; *i.e.*,

$$A = \frac{b \times a}{2}, \text{ or } A = b \times \frac{a}{2}.$$

4. Draw a right triangle whose base is 3 in. and whose perpendicular is 4 in. What is the area?

5. What is the area of an isosceles triangle whose base is 20 ft. and whose altitude is 15 ft.?

6. Draw by a scale of 1 to 24 a triangular field whose base is 36 rd. and whose altitude is 18 rd. What is its area?

7. What is the area of a triangular field whose altitude is 16 rd. 4 yd. and whose base is 34 rd. 4 ft.?

8. Draw an isosceles triangle, and with dotted line draw the altitude. Compare the size of the two triangles thus formed and the length of bases.

9. If the area of a triangle is 12 sq. in. and the base is 6 in., what is the altitude?

10. If the area of a triangle is 60 sq. ft. and the altitude is 12 ft., what is the base?

11. A lot of land in the form of a triangle whose base is 100 ft. contains $\frac{1}{2}$ A. What is the altitude?

12. To what scale is the above plan (Ex. 1) drawn? Connect the points *ce* and *bh* by straight lines. Find the area of the triangles.

1. Draw, as near as possible to a convenient scale, triangles representing the following measurements, and supply blanks:

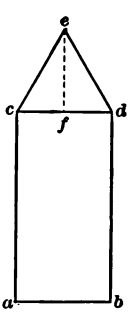
Base.	Altitude.	Area.
18 rd. 16 ft.	6 rd.	—
20 yd.	—	4 A.
—	50 ft. 4 in.	42 sq. rd.
120 ft. 8 in.	80 ft.	—
20 ch. 40 li.	16 ch.	—
50 ch. 25 li.	18 ch. 25 li.	—
40 rd. 12 ft.	—	2 A.

2. The perimeter of an equilateral triangle measures 180 ft. and its altitude is 51.9 ft. What is its area?

3. Required the area of a piece of land in the form of a right triangle, the base being 50 ft. long and the perpendicular being 48 ft. 6 in.

4. Two triangular pieces of land, one having an altitude of 48 ft. 6 in., the other of 80 ft., have bases of the same length, 110 ft. What is the difference in area of the two lots?

5. This figure represents the gable end of a house 48 ft. long. $ab = 21$ ft. 6 in.; $ac = 43$ ft.; $ef = 19$ ft. How many square feet of boards will be required to cover the two ends and sides, no allowance being made for openings?

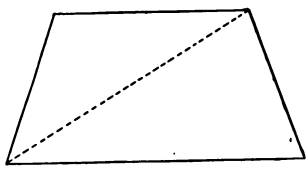


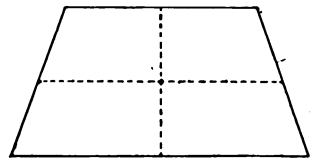
6. How many square feet on the gable end of a house, the height from eaves to ground being 40 ft. 6 in., from apex of roof to ground being 60 ft., and the width being 35 ft.?

7. Draw by convenient scale a line 60 ft. long. From any points on this line and from opposite sides erect vertical lines 12 ft. and 18 ft. long. Join the ends of these lines, and find the area of the inclosed quadrilateral.

8. The diagonal of an unequal sided quadrilateral is 40 rd. The verticals of the two triangles forming the quadrilateral are 28 rd. and 18 rd. Find the area of the quadrilateral.

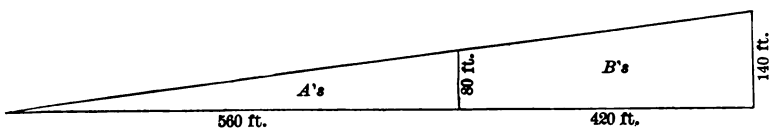
1. From either of the following figures, show that the area of a trapezoid is equal to the product of one-half the sum of the parallel sides and the distance between them.





2. A board 10 ft. long is 8 in. wide at one end and 12 in. wide at the other. How many square feet in the board?

3. The following diagram represents land belonging to A and B. Estimate the area of each lot.



4. Show in any way you can that the distance between two parallel sides of a trapezoid is equal to the area divided by one-half the sum of the parallel sides.

5. A piece of paper in the form of a trapezoid contains 10 sq. in.; the length of one of the parallel sides is 4 in. and of the other 6 in. How far apart are the parallel sides?

6. Which has the larger area, a triangle whose base is 80 ft. and altitude 60 ft., or a trapezoid whose base is 80 feet, side parallel to the base 60 ft., and distance between the two parallel sides 30 ft.? Draw diagrams and find area of each.

7. Draw by a convenient scale a lot of land in the form of a trapezoid whose parallel sides measure 80 ft. and 65 ft., and whose width is $\frac{1}{4}$ of the length of the longest parallel side. What is the area of the lot?

8. Show by drawing how you can find the area of any trapezium or of any polygon. What measurements are needed?

1. The diagonal of a trapezium is 4 ft., and the altitudes of the two triangles formed by the diagonal are 2 ft. and 1 ft. Draw the figure, and find the area of the trapezium.

2. Draw by a convenient scale a field in the form of a trapezium, the diagonal to measure 180 ft., and the altitudes of the two triangles to measure 80 ft. and 60 ft. What is the area of the field ?

3. Draw a circle, and indicate diameter; radius; arc; chord.

4. Draw a circle, and with compasses mark off arcs of 90°. How many of such arcs in a circle ?

5. In like manner find arcs of 60°; 40°; 45°.

6. Mark off on a circumference arcs of 90°, and join their extremities. What figure have you ?

7. Join extremities of arcs of 72°. What kind of a polygon have you ? Compare the length of the sides. Measure the angles and compare. This is a *regular* pentagon. Why ?

8. In like manner draw a regular hexagon; regular octagon, etc.

9. Divide a regular polygon into triangles, vertices at the centre. From this state how the area of all regular polygons is found.

10. Draw a regular hexagon whose sides measure 4 inches. Measure altitude and find area.

11. One side of a room in the form of a regular pentagon is 4.6 ft. long. From the centre to the middle of one side it is 3.16 ft. How many square feet in the room ?

12. Show by drawing how you find the area of a circle.

13. Show in any way you can the approximate ratio of the circumference of a circle to its diameter. What is the exact ratio ?

14. What is the circumference of a circle whose diameter is 8 ft.?

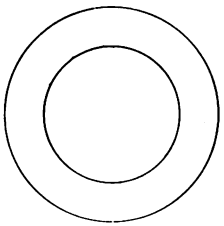
15. What is the diameter of a circle whose circumference is 15 ft.?

16. What is the area of a circle which has a circumference of 62.832 ft. ?

17. What is the area of a circular reservoir 916 paces in circumference, each pace being equal to 30 in. ?

18. At 8¢ a square yard, how much will it cost to cover with sods a circular piece of ground 25 ft. in diameter ?

1. A cow is tethered to a post with a rope 40 ft. long. How many square feet of land may she reach?

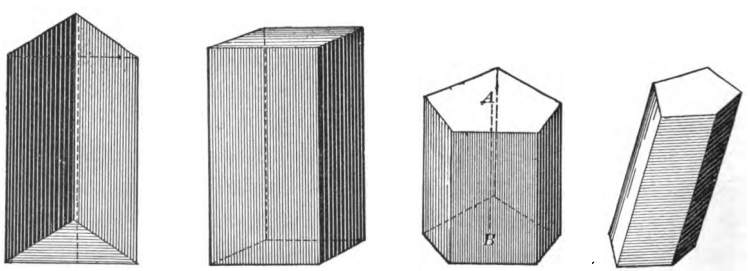


2. What is a circular ring? How may it be made? Show how the area of a ring may be found.

3. The area of a circular ring is 6 ft. wide. If the radius of the outer circle is 28 ft. what is the radius of the inner circle? What is the circumference of the inner circle? of the outer circle? What is the area of the ring?

4. A circular fish-pond whose circumference is 200 ft. has a walk around it 8 ft. wide. What will it cost to gravel the walk at the rate of 25¢ a square yard?

5. There is a circular park 320 rods in diameter. In the park there is a lake 140 rods in circumference. What is the area of the park, exclusive of the lake?



6. Examine and describe these prisms with reference to the shape of the lateral faces and the relative position of the bases. Name the prisms according to the shape of the bases. How are the first three prisms distinguished from the fourth? Describe a right prism; an oblique prism.

7. Show how to find the lateral surface of a prism; the entire surface.

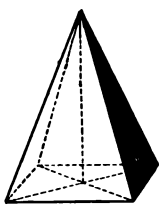
8. Show with blocks or drawings how to find the cubic contents of a rectangular prism; of a triangular prism; of any right prism.

1. Find the cubic contents of a triangular prism the area of whose base is 28 sq. ft. and whose altitude is 8 ft. 9 in.

2. Find the volume of a pentagonal prism the area of whose base is 32 sq. in. and whose altitude is 3 ft.

3. A cubical cistern whose sides measure 6 ft. 3 in. will hold how many barrels of water, reckoning a barrel to be $31\frac{1}{2}$ gal.?

4. Describe the base of this pyramid. Describe the other faces. What is the altitude of this pyramid? the slant height? In general, what is the altitude of a pyramid? the slant height? From the shape of its base, this pyramid is called a quadrangular pyramid. A pyramid whose base is a triangle is called what? whose base is a hexagon? whose base is an octagon?

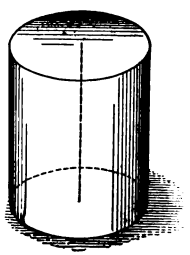


5. Observe and describe the right cylinder as to its lateral surface and the form of its bases. In what respects does it differ from the prism?

6. Cut a paper pattern exactly covering the convex surface of a right cylinder, and show how to find the area of the three surfaces.

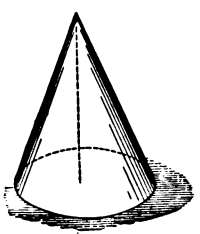
7. Show how to find the volume of a right cylinder.

8. How many gallons of water will fill a cylindrical boiler 3 ft. 6 in. high, 12 in. in diameter?



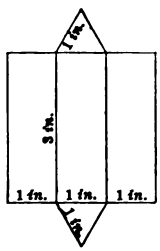
9. How high must a cylindrical cistern be to contain 800 gallons, if the diameter of its base is 4 ft.? How high if the diameter is 2 ft. 6 in.?

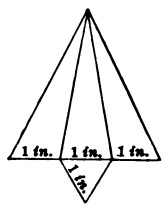
10. How many square feet of zinc will be required to line a box in the form of a cylinder $6\frac{1}{3}$ ft. in diameter and 4 ft. deep?

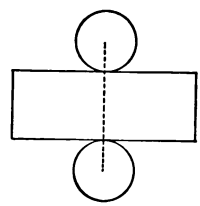


11. Describe the base and convex surface of a cone. What is the altitude of this cone? the slant height? In general, what is the altitude of a cone? the slant height? Cut a paper pattern exactly covering the convex surface of a cone.

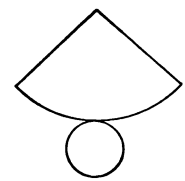
1. From stiff paper cut patterns of the shape and size indicated in the following figures. Fold in such a way as to make a triangular







Scale ½.



Scale ½.

prism and a triangular pyramid of the same base and altitude, and a cylinder and a cone of the same base and altitude. Fill each with dry sand, and find, by measuring or weighing, the relative size of the prism and pyramid and of the cylinder and cone. Since this ratio is true between all kinds of pyramids and their corresponding prisms, and between all cylinders and cones whose bases and altitudes are equal, what general rules can you give for finding the volume of pyramids and cones?

2. From models you have made, show how you find the convex surfaces of pyramids and cones.

3. Find the volume of a square pyramid 8 ft. on a side and 6 ft. high.

4. Find the volume of the Great Pyramid of Egypt, which was 480 ft. 9 in. high and 764 ft. square.

5. Find the total surface of a triangular pyramid whose slant height is 18 in. and side of base 12 in.

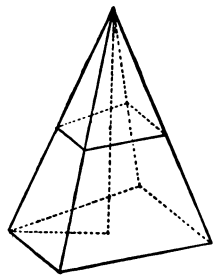
6. Find the height of a pyramid whose volume is 36 cu. in. and each side of whose square base is 4 in.

7. The circumference of the base of a circular cone is 10 ft. and its height is 6 ft. Find its volume.

8. How many tons of hay in a conical shaped haystack 30 ft. around the base and 16 ft. high, allowing 380 cu. ft. to a ton?

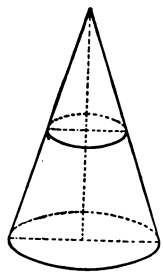
9. Find the convex surface of a cone whose slant height is 36 ft. and whose diameter at base is 2 ft. 6 in.

1. How is the frustum of a pyramid made? With paper make patterns of the frustum of a regular triangular pyramid; of a regular quadrangular pyramid. What is the shape of the lateral surfaces of these frustums? How many bases have frustums? What is their shape? How is the total surface of frustums found? How can you find the volume of the frustum of a pyramid?



2. The slant height of the frustum of a square pyramid is 8 in.; the length of one side of the lower base 6 in., and of the upper base is 4 in. What is the total surface?

3. Observe and describe the frustum of a cone. How is it made? With paper make a pattern of the lateral surface. Make patterns of the two bases. Show how you can find the total surface and the volume of the frustum of a cone.



4. Find the total surface of the following frustums of cones: (*a*) Slant height = 8 ft., radii of bases = 6 ft. and 4 ft. (*b*) Slant height = 20 ft., radii of bases = 12 ft. and 8 ft. (*c*) Slant height = $18\frac{1}{2}$ ft., diameter of bases = 20 ft. and $12\frac{1}{2}$ ft.

5. Find the volumes of the following frustums of cones: (*a*) Height = 6 in., diameter of bases = 8 in. and 4 in. (*b*) Height = 16 ft., radii of bases = 9 ft. and 6 ft.

6. Observe and describe a *sphere, diameter of sphere, great circle.*

7. With a sphere and enveloping cylinder show how to find the surface and the volume of a sphere.

8. Find the surface of a sphere whose diameter is 20 in.; whose radius is 15 in.; whose circumference is 4 ft.; whose radius is $6\frac{1}{2}$ in.

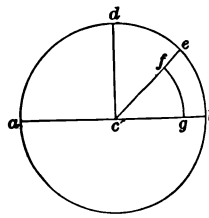
9. Find the volume of a sphere whose circumference is 20 in.; whose diameter is 2 ft.; whose radius is 6 in.

10. At \$3 a square yard, how much will it cost to bronze a dome which is in the form of a hemisphere whose diameter is 60 ft.?

11. How many bullets $\frac{1}{4}$ in. in diameter can be cast from a lead ball 2 in. in diameter? from a ball 1 ft. in diameter?

Longitude and Time.

1. In this circle, what line represents the circumference? what a diameter? what a radius? what an arc? For purposes of measurement the circumference of a circle is divided into 360 parts, called degrees (°). How many degrees in a semi-circumference? How many degrees in the arc *ad?* in *de?* Show by drawings arcs of 180°; 90°; 45°; 10°; 30°. Through how many degrees does the hour-hand of a clock move in 12 hours? in 3 hours? in 1 hour? Through how many degrees does the minute-hand of a clock move in 15 minutes? in 1 minute? in 10 minutes?



2. An angle at the centre of a circle is measured by the number of degrees in the arc opposite to it. What is the size of the angle *acd?* of *dce?* Show by drawings that angles of a given degree have the same size in all circles, while the arcs which measure them may differ. (See arcs *fg* and *be.*)

3. The hour and minute-hands of a clock form what angle at 9 o'clock? at 2 o'clock? at 11 o'clock?

4. Find on the globe arcs of different degrees. Are the degrees on the parallels of the same length or of different length? Where longest?

5. Estimate the length of a degree at the equator, the distance around the earth being 24,900 miles.

6. If the length of a degree at 60° N. latitude is 34.53 mi., what is the distance around the earth on that parallel?

7. The length of a degree on a parallel 30° N. latitude is 59.81 miles. What is the distance on that parallel of 10°? of 40°? of 180°? around the earth?

8. What is the length in miles of a degree of latitude?

9. What is the width in degrees of the Torrid Zone? What is its width in miles?

10. What is the width in degrees of the North Temperate Zone? What is its width in miles?

1. Each degree is divided into 60 equal parts called minutes, and each minute is divided into 60 equal parts called seconds. Fill out the following table:

— seconds (″) = 1 minute (′)
— minutes = 1 degree (°)
— degrees = 1 circumference.

2. How many minutes in 4°? How many seconds?
3. Change 10° 40′ to minutes.
4. Change 4° 20′ to seconds.
5. Change to minutes: 8° 15′; 6° 45′; $\frac{1}{6}$ of a degree; 15° 50′.
6. Change to seconds: 1° 10′; 4° 20′ 30″; 6° 12′; $\frac{1}{4}$°; $\frac{1}{6}$′.
7. Change to units of a lower denomination: $\frac{1}{6}$°; $\frac{1}{5}$′; $2\frac{1}{8}$°.
8. Change to units of a lower denomination: $4\frac{1}{5}$°; $3\frac{1}{3}$′; .65°; .35′.
9. What part of a degree is 6′ 10″? 45″? $3\frac{2}{3}$′?
10. Change to decimal of a degree: 6′ 20″; 3′ 40″.
11. Change to decimal of a degree: 45′ 10″; 45″.
12. Add 4° 40′ 10″ to 6° 10′ 30″.
13. Add 16° 50″ to 20° 30′ 40″.
14. Add: 1° 35′ 28″ + 46′ 42″ + 7° 12′ 34″.
15. Point out on the globe or map of the world a place 40° N. lat.; 10° S. lat.; 70° N. lat.; 48° S. lat.
16. Regarding the meridian of Greenwich as zero, point out a place on the globe that is 10′ W. long.; 50° W. long.; 20° E. long.; 140° E. long.
17. Point out a place that is 10° N. lat. and 20° W. long.; 40° S. lat. and 60° E. long.; 60° N. lat. and 50° E. long.
18. Tell from observation of globe or map the latitude and longitude of New York; of Paris; of Berlin; of Rio Janeiro.
19. How far apart in degrees, minutes, and seconds are two towns, one situated 12° 20′ N. lat. and the other 10° 50′ S. lat.?
20. Required the distance between a point 42° 40′ N. lat. and a point 30° 20′ N. lat.
21. What is the distance in degrees and minutes between Chicago, which is 87° 35′ W. long., and Paris, which is 2° 20′ 22″ E. long.?

1. A ship goes 15′ an hour. Through how many degrees does it go in a day, if it goes due east or west?

2. How many days will it take a ship to go from New York to Liverpool, if it goes at an average rate of 15′ of longitude an hour?

3. A ship going at the rate of 16′ 20″ an hour will take how long to sail 20°?

4. A ship going at the rate of 12′ 35″ an hour goes how far in 12 hours?

5. If it takes a ship 22 days 5 hours to go from New York to Liverpool, a distance of 71°, what is the average number of degrees of longitude that it sails per hour?

6. Show by the globe that all places on the same meridian have their noon at the same time.

7. Mention two places that have sunrise at the same time of day.

8. Mention two places that have midnight at the same time.

9. The earth moves on its axis from west to east, therefore the sun seems to move from east to west. Through how many degrees does it move in 24 hours? 1 hour? 1 minute?

10. Through how many degrees does the sun move in 12 minutes of time? 3 hours of time?

11. When it is noon in Chicago, will it be forenoon or afternoon in New York, and why?

12. When it is noon in New Orleans, is it forenoon or afternoon in San Francisco, and why?

13. What is the difference in actual time between two places that are 10° apart? between two places that are 6° 30′ apart? 25° 20′ apart?

14. A man in travelling east will find that his watch is slower or faster than the local time? How much for every degree that he goes?

15. The longitude of A is 110° 30′ west, and of B is 10° 15′ east. What is the time at B when it is 3 o'clock P.M. at A? What is the time at A when it is 10 o'clock P.M. at B?

16. The longitude of A is 34° 40′ east. What is the longitude of B, whose time is 6 o'clock P.M. when it is 11 h. 30 min. A.M. at A?

Location of Cities.

Cities.	Longitude.	Cities.	Longitude.
New York,	74° 0′ 24″ W.	Washington,	77° 0′ 36″ W.
Chicago,	87° 37′ 47″ W.	Rome,	12° 27′ E.
New Orleans,	90° 3′ 28″ W.	Berlin,	13° 23′ 45″ E.
London,	0° 5′ 38″ W.	San Francisco,	122° 23′ 19″ W.
Paris,	2° 20′ E.	Calcutta,	88° 20′ E.
Boston,	71° 3′ 30″ W.	St. Louis,	90° 18′ W.

1. When it is noon in New York, is it before or after noon in each of the other cities named above?

2. When it is 12 o'clock noon at Greenwich, what is the local time at each of the cities named?

3. When it is 4 P.M. in Washington, D. C., what is the local time in Rome? in Paris? in Calcutta?

4. Make up and solve five problems upon difference of time, based upon the location of the above named cities.

5. If the difference of local time between two places is 1 hour, how many degrees are they apart?

6. If the difference of local time between two places is 2 h. 25 min., how far are they apart?

7. A man travelling finds that his watch has lost 20 minutes during his journey, as compared with local time. If his watch is a reliable timekeeper, how far from his original starting-place, east or west, has he journeyed?

8. What is the difference in the time of sunrise between Berlin and San Francisco?

9. How much earlier does the sun rise in London than in Chicago?

10. If the difference in time between two places is 1 h. 20 min., what is the difference in longitude?

11. When it is noon in Minneapolis, it is 29 minutes 6 seconds past 1 by true time in Boston. What is the longitude of Minneapolis?

12. The exact time difference between New York and Trieste is 5 h. 49½ min. What is the longitude of Trieste?

1. The time given in the foregoing problems is true local time. *Standard time*, generally used in the United States, is the true time of a selected meridian. Thus, the United States is divided into four sections, each of 15° of longitude. The Eastern section includes all territory extending $7\frac{1}{2}$° on each side of the 75th meridian. The standard time of this section, called the Eastern standard time, is the true time of places on the meridian 75° west of Greenwich. How many hours is this time later than that of Greenwich? Central standard time is that of the meridian 90° west of Greenwich. How far either side of this meridian does this section extend? How many hours is Central standard time later than Eastern standard time? Mountain standard time is that of the meridian 105° west of Greenwich. How many degrees each side of this meridian does the Mountain section extend? Compare the time of this section with that of the Eastern section and with that of the Central section. The Western or Pacific standard time is that of 120° west of Greenwich.

2. Mention five cities that are included in each of the above sections. When it is 12 o'clock standard time in Chicago, what is the standard time in Indianapolis? in Pittsburgh? in Denver? in San Francisco? in New Orleans? in Boston? in Omaha?

3. When it is 4 o'clock P.M. in Philadelphia, what is the standard time in San José? in Portland, Me.? in Springfield, Ill.?

4. When it is 9 h. 15 min. A.M. in Milwaukee, what is the standard time in Charleston, S. C.? in Sacramento, Cal.?

5. What is the difference between the true local time and the standard time in Cincinnati? in Wilmington, N. C.? in St. Paul? in your own city or town?

6. If the almanac gives the true time of sunrise for New York, how can the standard time of sunrise be found for Boston? for Cleveland? for Springfield, Ill.?

7. When it is 8 o'clock by standard time in St. Louis, what is the local time in St. Petersburg? in Honolulu?

8. With any almanac in common use make up problems estimating the true and standard time of sunrise, sunset, moonrise, etc.

SECTION VII.

RATIO AND PROPORTION.

1. 6 blocks are how many times 2 blocks? 4 apples are what part of 8 apples? that is, What is the relation of 6 blocks to 2 blocks? and 4 apples to 8 apples? This relation may be expressed:

6 blocks : 2 blocks. 4 apples : 8 apples.

2. Express the relation or ratio of 16 pounds to 10 pounds; of 12 ounces to 15 ounces; of 4 quarts to 5 quarts.

3. What is the ratio of 8 to 2? 16 to 4? 40 to 8? 12 to 5? 28 to 20? 3 to 12? 4 to 20? $\frac{1}{2}$ to $\frac{1}{4}$? 4 to $\frac{3}{4}$? $1\frac{1}{3}$ to 9?

Find the ratios of the following couplets:

4. 18 : 7; 12 : 20; 15 : 2; 4 : 50; $2\frac{1}{2}$: 10.

5. $2\frac{1}{2}$: $1\frac{3}{4}$; $\frac{1}{8}$: 3; $16\frac{1}{2}$: $1\frac{1}{4}$; 100 : $8\frac{1}{3}$; $3\frac{1}{3}$: 50.

6. \$18 : \$10; \$4.50 : \$9; \$10 : \$.50; \$4.80 : \$16; \$1200 : \$3.

7. 1 gal. : 1 qt; $1\frac{1}{2}$ ft. : 1 yd.; $1\frac{1}{4}$ bu. : $2\frac{1}{2}$ pk.; $\frac{1}{2}$ mi. : 500 ft.

8. £4 6*s.* : 12*s.*; 6 pk. 3 qt. : 6 qt.; 3 pt. : 4 qt. 1 pt.

9. Name the antecedent and consequent in each of the above ratios.

10. What is the effect of multiplying the antecedent? of multiplying the consequent? of dividing the antecedent? of dividing the consequent? (Show by examples.)

11. What is the effect of multiplying or dividing both terms by the same number? (Show by examples.)

12.	4 : ? = 2	6 : $2\frac{1}{2}$ = ?	.2 : .01 = ?
13.	? : 4 = 2	8 : ? = $\frac{1}{2}$	? : .05 = 10
14.	$\frac{1}{2}$: ? = $\frac{1}{4}$	? : $\frac{1}{3}$ = 6	? : 5 = .01

15. Name and express five couplets which have the same ratio as 4 : 2; 8 : 6; 12 : 9; 3 : 12; 2 : 7; 12 : 40.

1. The ratio of 8 to 4 is equal to the ratio of 12 to 6. This proportion is expressed as follows : $8 : 4 = 12 : 6$. In the same way express the proportion 8 is to 2 as 12 is to 3.

2. Name two couplets whose ratios are equal, and express them by figures and signs in the form of a proportion.

3. Write ten proportions similar to the one asked for in the last exercise.

Supply the 4th term of each of the following proportions :

	4.	5.	6.
a.	$4 : 2 = 8 : —$	$1 : 2 = 4 : —$	$\frac{1}{4} : \frac{1}{2} = 6 : —$
b.	$8 : 2 = 16 : —$	$2 : 4 = 6 : —$	$\frac{1}{3} : 1 = 4 : —$
c.	$10 : 5 = 20 : —$	$8 : 2 = 4 : —$	$1\frac{1}{2} : 3 = 6 : —$
d.	$12 : 3 = 4 : —$	$6 : 1 = 3 : —$	$6 : \frac{1}{8} = 24 : —$
e.	$9 : 3 = 3 : —$	$3 : 9 = 6 : —$	$2 : 8 = 4\frac{1}{2} : —$
f.	$16 : 8 = 8 : —$	$4 : 20 = 8 : —$	$4 : 10 = 12 : —$
g.	$15 : 5 = 30 : —$	$16 : 2 = 4 : —$	$3 : 8 = 1\frac{1}{2} : —$
h.	$20 : 4 = 10 : —$	$2 : 20 = 8 : —$	$5 : 2 = 20 : —$
i.	$40 : 10 = 20 : —$	$12 : 2 = 24 : —$	$24 : \frac{1}{2} = 6 : —$
j.	$24 : 4 = 12 : —$	$4 : 40 = 2 : —$	$3\frac{1}{2} : 7 = 14 : —$

7. What terms of a proportion are the extremes ? the means ?

8. Compare the product of the means with the product of the extremes.

9. How can a missing term of a proportion be found ?

Supply the 4th term of the following proportions :

	10.	11.	12.
a.	$2 : 3 = 6 : —$	$3 : 8 = 2 : —$	$1 : .01 = 10 : —$
b.	$3 : 4 = 6 : —$	$4 : 5 = 6 : —$	$.4 : .1 = 4 : —$
c.	$6 : 4 = 9 : —$	$8 : 7 = 4 : —$	$.1 : .01 = 20 : —$
d.	$8 : 3 = 12 : —$	$9 : 2 = 8 : —$	$4 : .04 = 100 : —$
e.	$12 : 15 = 4 : —$	$12 : 10 = 8 : —$	$2.5 : .5 = .01 : —$
f.	$2 : \frac{1}{2} = 3 : —$	$7 : 2 = 6 : —$	$.08 : .16 = .2 : —$
g.	$\frac{1}{2} : 3 = 2 : —$	$2\frac{1}{2} : 6 = 1 : —$	$7 : 8 = .1 : —$
h.	$2\frac{1}{2} : 1 = 1 : —$	$6 : 3\frac{1}{3} = 3 : —$	$.2 : \frac{1}{2} = 6 : —$
i.	$4 : \frac{1}{3} = 9 : —$	$8 : 2 = 2\frac{1}{2} : —$	$\frac{1}{4} : .4 = 10 : —$

Supply the missing terms of the following proportions:

	1.	2.	3.
a.	8 : — = 4 : 2	6 : 9 = 8 : —	3 : 8 = 9 : —
b.	— : 3 = 4 : 6	8 : — = 6 : 20	5 : — = 10 : 6
c.	4 : 2 = — : 12	— : 12 = 4 : 15	— : $\frac{8}{6}$ = 6 : 10
d.	— : 8 = 3 : 24	8 : — = 9 : 2	$\frac{3}{4}$: $1\frac{1}{2}$ = 6 : —
e.	12 : — = 4 : 3	15 : 11 = — : 3	$16\frac{2}{3}$: $33\frac{1}{3}$ = 4 : —
f.	18 : — = 6 : 4	$\frac{1}{8}$: 12 = $\frac{1}{2}$: —	12 : $\frac{1}{6}$ = — : $\frac{3}{4}$
g.	15 : 6 = — : 2	2 : 11 = — : 18	$\frac{3}{5}$: $2\frac{1}{10}$ = 6 : —
h.	3 : 8 = — : 24	4 : — = 11 : 7	— : 4 = 14 : 8
i.	— : 12 = 4 : 6	— : 9 = 6 : 8	.08 : — = .2 : .4
j.	2 : 10 = — : 15	5 : $\frac{1}{2}$ = — : 8	.03 : 9 = — : 3

	4.	5.
a.	4 lb. : 20 lb. = \$1.60 : ?	16 lb. : $2\frac{1}{2}$ lb. = \$.70 : ?
b.	6 bbl. : 18 bbl. = \$30 : ?	1800 lb. : 2 T. : \$6 : ?
c.	18 qt. : 3 qt. = \$1.50 : ?	$\frac{1}{2}$ yd. : $1\frac{1}{2}$ yd. = \$$\frac{8}{8}$: ?
d.	20 yd. : 6 yd. = \$1.75 : ?	8 oz. : $1\frac{1}{2}$ lb. = \$.50 : ?
e.	\$1.50 : \$3 = 6 lb. : ?	$1\frac{1}{2}$ lb. : $\frac{3}{4}$ lb. = \$.30 : ?
f.	\$6 : \$1.25 = 80 lb. : ?	\$36 int. : \$12 int. = \$600 prin. : ?
g.	8 T. : 100 T. = \$50 : ?	\$1.25 : \$.25 = 15 lb. : ?
h.	1 lb. 8 oz. : 20 lb. = \$.16 : ?	45 min. : 30 min. = 9 examples : ?
i.	1 T. : 100 lb. = \$8.50 : ?	1 qt. : 3 pt. = \$.05 : ?
j.	\$.08 : \$100 = $1\frac{1}{2}$ lb. : ?	\$500 : \$200 = \$$1\frac{1}{2}$: ?

6. If 2 apples cost 4 cents, what will 6 apples cost? *(Perform this and the following exercises by proportion and by analysis, writing on slate or paper the proper form.)*

7. For 1 bushel of potatoes I pay 60 cents. What should I have to pay for 8 bushels at the same rate?

8. At the rate of 10 cents a quart, what will 8 quarts of cranberries cost?

9. How many dozen eggs can I buy for 60 cents at the rate of 20 cents a dozen?

10. Two oranges are worth 5 cents. What are 20 oranges worth?

1. At the rate of 2 for 3 cents, how many apples can I buy for 30 cents?

2. If a man earns $64 in 8 weeks, how much will he earn in 10 weeks?

3. If 15 bushels of wheat make 3 barrels of flour, how many bushels of wheat will be required to make 5 barrels of flour?

4. What will 150 lb. of cheese cost if 6 lb. cost 57 cents?

5. An express train runs 30 miles in 45 minutes. At the same rate, how many miles will it run in 100 minutes?

6. What is a servant's wages for 16 weeks at the rate of $1.40 a week?

7. If 80 acres of land cost $2000, what will 45 acres cost?

8. If 25 acres of land cost $600, how many acres can be bought for $3500?

9. How many bushels of corn can be bought for $1240, when every 6 bushels cost $5?

10. If 2 men build 18 rods of wall in a week, how many rods will 50 men build in the same time?

11. How many tons of hay can be made from 640 acres of land, if 15 tons can be raised from 4 acres?

12. If 8 horses eat a certain quantity of hay in 120 weeks, how long would the same quantity last 18 horses?

13. If 12 men can mow a meadow in 8 days, how long will it take 20 men?

14. If $\frac{1}{12}$ of a ship is worth $1260, what is $\frac{7}{8}$ of her worth?

15. If a steeple 120 ft. high casts a shadow 300 ft., what is the length of the shadow cast at the same time by a staff 8 ft. high?

16. If a post 9 ft. high casts a shadow 5 ft. long, how high is a monument which casts a shadow 62 ft. long?

17. If 140 men can dig a trench in 24 days, how many men will be required to dig it in 7 days?

18. If a train runs 160 miles in 5 h. 30 min., what is the rate per hour?

19. If the shadow of a staff 4 ft. high is 5 ft. 6 in., what is the height of a steeple whose shadow at the same time is 142 ft.?

1. If a steamer from New York to Liverpool, a distance of 3000 miles, makes the passage in $6\frac{1}{2}$ days, how many miles a day on an average does the steamer go?

2. If $\frac{5}{8}$ of a farm is worth \$2200, what is $\frac{3}{8}$ of it worth?

3. How many yards of cambric 32 in. wide will be required to line $18\frac{1}{2}$ yd. of silk 24 in. wide?

4. If crackers can be sold at 8 cents a pound when flour is worth \$6.25 a barrel, for what can they be sold when flour is worth \$10 a barrel, allowing no difference in cost of making?

5. If \$500 will yield \$64 interest in a certain time, what interest will \$8640 yield in the same time?

6. If a clock ticks 110 times in a minute, how many times will it tick in 10 hours?

7. A cistern containing 10,000 gallons of water leaks at the rate of 9 gallons in 6 hours. In how long a time will the leaks empty the cistern?

8. It took 30,000 men 43 years to build the imperial canal of China. How many men would have to be employed to dig the canal in five years?

9. It takes 8 rolls of paper 30 inches wide to paper a room. How many rolls will it take if the paper is but 22 inches wide?

10. If in canning 6 lb. of peaches, $2\frac{1}{2}$ lb. of sugar is needed, how many pounds of sugar are needed for 45 lb. of peaches?

11. If a train goes 42 miles in 1 h. 45 min., how far at the same rate will it go in 2 days? How many hours at the same rate will it take the train to go 400 miles?

12. If the interest of \$840.60 for a given time is \$68.40, what will the interest of \$8320 be at the same rate?

13. If it costs \$150 to build a road $1\frac{1}{2}$ rods long, what will a mile of road cost at the same rate?

14. What is the weight of 1 cu. ft. of iron whose specific gravity is $7\frac{1}{18}$ if $27\frac{3}{7}$ cu. in. of water weighs 1 pound?

15. If a loaf of bread weighs 1 lb. 4 oz. when flour is \$6.50 a barrel, what should a loaf of the same cost weigh when flour is \$4.25 a barrel?

1. How may 12 cents be divided between two boys so that their shares will be in the ratio of 1 to 2?

2. The sum of the ages of a father and his son is 40 years. The father is 3 times the age of the son. How old is each?

3. Two men contracted to do a certain piece of work. A worked 3 days and B 7 days. What part of the contract price should A receive?

4. A and B hire a pasture for $24. A pastured 4 cows and B pastured 2 cows. How much should each pay?

5. Three men, A, B, and C, hire a pasture for $30. A put in 6 horses, B 5 horses, and C 4 horses. What ought each to pay?

6. Divide 66 cents in the proportion of 1, 2, 3.

7. Divide $840 in the proportion of 2, 3, 4.

8. Divide $1680 between A, B, and C so that A gets twice as much as B, and B gets three times as much as C.

9. Divide 24 apples among three boys in the proportion of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$.

10. Divide 840 into two parts, one of which is $\frac{3}{4}$ of the other.

11. The sides of a triangle are in the proportion of 2, 3, and 4. If the shortest side is 12 rods, what is the length of the other sides?

12. A man dying left his property of $50,000 to be divided among his children, so that each daughter should have $\frac{1}{8}$ more than a son. If there are 4 daughters and 3 sons, how much ought each to receive?

13. If 18 rolls of paper 24 in. wide will cover the walls of a room, how many rolls will be needed if the paper is $\frac{3}{4}$ yd. wide?

14. If 59 lb. of oats have as much nutrition as 100 lb. of good hay, how many pounds of hay have as much nutrition as a ton of oats?

15. If $2\frac{1}{4}$ bu. of wheat are required to plant an acre, how many acres will 840 lb. plant?

16. The ratio of the weight of white pine to that of the weight of white oak is 17 : 27. If a cubic foot of oak wood weighs 54 lb., what will a cord of white pine weigh?

17. If 15% of beef is composed of muscle-making properties, and 24% of beans is thus composed, how many pounds of beans have as much muscle-making material as a barrel of beef?

1. Two men went into business together, agreeing to share the profits or losses in proportion to the capital put in. A put $1000 into the business, and B $2000. They found at the end of a year that the profits amounted to $1200. What is each man's share?

2. A, B, and C were partners in business. A put in $10,000, B $6000, and C $9000, and their profits in two years were $12,000. What was each partner's share of the profits?

3. A and B are partners. A furnishes $6000 and B $2500. They lose $900. What is each man's share of the loss?

4. A and B enter into partnership, agreeing that A should have $\frac{2}{3}$ as much of the profit as B. They gain $4500. What is each man's share?

5. Hall & Reed enter into partnership with the understanding that they shall share profits in the proportion of $\frac{1}{2}$ and $\frac{1}{3}$. If their profits are $1480, what is each partner's share?

6. A store owned by A, B, and C, valued at $68,000, is destroyed by fire, having been insured for $\frac{3}{4}$ of its value. The shares of the partners are in the proportion of 2, 3, and 4. What is each man's share of loss?

7. A and B undertake a contract for $1800. A furnishes 8 men for 24 days, and B 12 men for 30 days. What sum of money should each contractor receive?

8. Three men hired a pasture for $140. A put in 6 cows, B put in 4 cows, and C put in 3 cows for 15 weeks. What ought each to pay?

9. A and B hire a pasture for $80. A puts in 4 yoke of oxen, and B puts in 40 sheep. If 1 ox is equal to 8 sheep, how much ought each to pay?

10. A, B, and C entered into a partnership with a combined capital of $60,000. At the end of a year A's share of the profits was $2600, B's share $3400, and C's was $4000. What was each man's capital invested?

11. A, B, and C bought a farm for $12,000, and sold it for $14,500. If A's share of the profits was $800, and B's $1000, what sum was invested in the farm by each man?

1. If 4 men can mow a field of 3 acres in 3 days, how long would it take 6 men to mow a field of 8 acres?

(The number of days depends upon the number of men and the number of acres. How many ratios?)

2. 8 lamps consume 3 gallons of oil in 9 days. How many gallons will 4 lamps consume in 12 days?

3. If 168 lb. of flour supply a family of 8 persons 6 weeks, how many weeks would 2 barrels last a family of 12 persons?

4. If a man walks 160 miles in 8 days of 6 hours each, how many miles at the same rate would he walk in 12 days of 8 hours each? How many days at the same rate would it take him to walk 500 miles, if he walked 7 hours a day?

5. If \$250 gains \$10 in 6 months, how long will it take \$750 to gain \$25?

6. If \$60 is paid for the work of 16 men for 3 days, what should be paid 24 men for 8 days' work at the same rate?

7. If 4 men working 9 hours a day do a certain piece of work in 15 days, how many days would it take 6 men working 8 hours a day to do the same work?

8. 80 rods of wall were laid by 18 men in 24 days. How many rods of the same kind of wall ought 40 men to lay in 50 days?

9. If it costs \$80 to make a sidewalk 65 ft. long, 6 ft. 6 in. wide, how much will a sidewalk cost that is 180 ft. long and 8 ft. wide? How long a walk 6 ft. wide ought to be made for \$200?

10. If 12 men in 30 days of 8 hours each can build a wall 82 rd. 10 ft. long, how many rods of the same kind of wall can be built in a day of 10 hours by 18 men?

11. A man desires to mix tea worth 40¢ a pound with tea worth 50¢ a pound, that the mixture may be worth 48¢ a pound. If he mixed 1 pound of each kind, what would he gain on the 40¢ kind? What would he lose on the 50¢ kind? In what proportion should he mix them so as to sell the mixture for 48¢ a pound?

12. In what proportion must 2 kinds of sugar worth 6¢ and 8¢ a pound be mixed that the mixture may be worth $6\frac{1}{2}$¢ a pound? In what proportion that the mixture may be worth $7\frac{1}{4}$¢?

SECTION VIII.

Miscellaneous Exercises.

1. A boy spent $\frac{3}{4}$ of his money and had 80 cents left. How much had he?

2. If I spend .55 of my money and have $32.85 left, how much do I spend?

3. A man's tax is $54, which is .001 of the value of his estate. What is the value of his estate?

4. What is the interest of $800 for 9 mo. 15 da. at 6%? of $600 for 1 yr. 3 mo. at 5%? of $1250 for 30 da. at 7%?

5. What per cent is gained if ribbon costing 12¢ a yard is sold at 15¢ a yard? at 18¢? at 21¢? at 24¢?

6. What is the per cent of gain or loss in buying sugar at $5 a hundredweight and selling it at $5\frac{1}{2}$¢ a pound? in buying wheat at $1.25 a cental and selling it at 75¢ a bushel?

7. Cloth costing $4.50 a yard was marked $5.50, and was sold for 40% less than marked price. What was the selling price? What was the loss per cent?

8. 40 men were killed or wounded in a regiment of 860 men. What per cent of the regiment was not hurt?

9. If 25¢ interest is charged for the use of $40 for a week's time, what rate per annum is charged?

10. If a farmer can hoe $\frac{1}{4}$ of a field of corn in a day, how many days will it take him to hoe the entire field? If his son John can hoe only $\frac{1}{6}$ of it in a day, how many days will it take him? What part of it can they both hoe in one day? How many days will it take both to hoe the field?

11. John and James can saw a pile of wood in 6 hours. John alone can saw it in 8 hours. In how many hours can James alone saw it?

1. How many hours and minutes are there from quarter past 6 in the morning to quarter of five in the afternoon?

2. A wheel $8\frac{1}{3}$ ft. in circumference turns 50 times in going from one place to another. How many rods apart are the two places?

3. Divide 4 dozen marbles between two boys so that one boy will have twice as many as the other. How many will each boy have?

4. Supply the proper number in the following statement: At 20 cents a dozen I can buy — eggs for 45 cents.

5. Robert and William have together 15 cents. Robert has 3 cents more than William. How many cents has each?

6. How shall A and B divide $35 between them so that A shall have $\frac{2}{4}$ as many dollars as B?

7. The total crop of cotton in the United States in 1892 was 9,038,707 bales. If the average net weight per bale was 440 lb., how many tons of cotton were raised?

8. The wheat crop in this country in 1892 was 519,490,000 bushels. How many pounds? How many tons?

9. From the above figures find the difference in value between the cotton crop and the wheat crop, estimating cotton to be worth 9¢ a pound and wheat 75¢ a bushel.

The standing of the playing of the various base ball clubs at a certain time was as follows:

	Games Won.	Games Lost.		Games Won.	Games Lost.
Washington	28	32	Baltimore	15	45
Cleveland	33	25	St. Louis	24	34
New York	26	33	Brooklyn	37	22
Boston	44	17	Cincinnati	32	26
Louisville	24	37	Pittsburg	29	33
Philadelphia	37	22	Chicago	27	30

10. Give the per cent (to hundredths of per cent) of games won for each club.

1. If an iron bar when heated from 0° to 1° Centigrade expands by $\frac{1}{7\,5\,0\,0}$ of its length, what will be the length at 40° of a bar whose length at 0° is 25 ft.?

2. All good air contains about 4 parts of carbonic acid gas to 10,000. What per cent of good air is carbonic acid gas?

3. 24 is $\frac{1}{3}$ less than what number? 25% more than what? 20% less than what?

4. $\frac{1}{2}$ is what per cent of $\frac{3}{4}$? of $1\frac{1}{2}$? of $\frac{1}{8}$?

5. $2.5 \div .5 = ?$ $.09 \div .03 = ?$ $8 \div .004 = ?$ $.08 \div 40 = ?$

6. $.72 \div 9 = ?$ $.03 \times 100 = ?$ $.008 \times 100 = ?$ $7.2 \div .003 = ?$

7. At .3 of a cent apiece how many iron bolts can I buy for 60¢? for \$12? for \$63.30? What will 1000 bolts cost? 8 gross? 16 dozen?

8. What is the interest of \$350 for 1 yr. 2 mo. at 6%? for 3 yr. 3 mo. at $4\frac{1}{2}$%? for 9 mo. at $7\frac{1}{2}$%?

9. What is the interest of \$1800 for 90 da. at $5\frac{1}{2}$%?

10. A house valued at \$4500 is insured for $\frac{3}{4}$ of its value at $1\frac{1}{2}$%. What is the premium?

11. If my tax is \$22.40 in a town whose rate of taxation is \$14.80 on \$1000, for what am I taxed?

12. A man and a boy can heel 300 pairs of shoes per day by the use of machinery. It required formerly only 5 men to do this amount of work. Reckoning the boy's labor as equivalent to half that of a man, what percentage of the former amount of labor has been saved by the use of machinery?

13. If Western Union Telegraph stock is at a premium of 20%, how much must be paid for 85 shares (par value, \$100)?

14. \$9856 buys how much stock at $3\frac{1}{2}$% premium (p. v., \$100)?

15. I sell stock at 34 that cost me 52. What per cent is lost?

16. \$4630 buys how much stock at $87\frac{1}{2}$?

17. Required the price of \$75,000 new U. S. 4's at 118.

18. What annual income will be derived from 8 one thousand dollar U. S. $4\frac{1}{2}$'s?

19. A man owing \$32,000 R. R. bonds receives a quarterly income of \$700. What rate of interest if bought at par?

1. If I should forward $4969.44 to a broker in New Orleans for the purchase of cotton, his brokerage being 2%, how many bales of cotton should he return at $42 per bale?

2. My house, which cost me $9000, is insured for $\frac{2}{3}$ of its value at $\frac{5}{8}$% premium. What is my actual loss if it burns?

3. At 42%, what is the duty on 240 tons of bar iron (long ton), invoiced at $3\frac{1}{2}$¢ a pound, tare 5%?

4. The school tax of a certain town being $11,250, at the rate of $3\frac{1}{4}$ mills on a dollar of taxable property, what is the taxable property?

5. At the age of 28 my life was insured for $5000. If I paid $127.75, including $1 for the policy, what premium did I pay on $1000?

6. Sold my watch for $40 at a loss of 22%. For how much should I have sold it to gain 35%?

7. A broker bought railroad stock at 5% discount, and sold it at 12% premium, making $714. How many $100 shares did he buy?

8. James Brewster built a house costing $10,000 upon a lot which cost $500. The house was burned, and he received $66\frac{2}{3}$% of its cost from the insurance company. If he then sold the land for $875, did he gain or lose, and what per cent?

9. A fire insurance company took a risk of $30,000 at 4%, and reinsured $\frac{3}{4}$ of the risk in another company at $3\frac{1}{2}$%. How much will the first company lose if the property be burned?

10. Shreve, Crump & Low imported 40 Geneva watches at $60 each, and 55 other watches at $95 each. What did they cost, duty at 40% *ad valorem*, and for how much apiece must they be sold to gain $12\frac{1}{2}$%?

11. Find the entire tax of a town in which the taxable property is $642,000, the rate 15 mills on a dollar, there being 252 polls paying $1.50 apiece.

12. What are the net proceeds from the sale of 3460 bbl. of sugar at $12.50 per barrel, charges for freight and storage being 35¢ per barrel, commission for selling 3%, and $1\frac{1}{2}$% for guaranteeing payment?

1. Spreckel & Co. sent their agent in Hawaii $1530 to invest in sugar, after deducting his commission of 2%. How much will he expend in sugar?

2. What is the duty on 6420 lb. of steel at 2⅞¢ a pound and 12½% *ad valorem*, invoiced at 25¢ a pound, damage being 6%?

3. A tax of $48,000 at the rate of ⅞% was raised in a certain town. Find the valuation.

4. A watch which loses 40 seconds a day is set right at 4 P.M. on June 6. What is the true time on the 30th of June, when the time indicated by the watch is 4 P.M.?

5. A man buys $300 worth of goods on 4 months' credit. At the expiration of 4 months the seller draws on his customer for 30 days, for which he charged interest at 6% per annum. What is the sum due at the end of 30 days?

6. $600 was put into the savings bank January 1, 1880; $70 was taken out July 1, 1883, $60 January 1, 1885, and the balance July 1, 1888. What was the balance, interest compounded semi-annually at 4%?

7. At what rate of interest will $240 amount to $269.40 in 3 yr. 6 mo.?

8. Sold flour for my employer for $4800, and with the balance, after deducting my commission of 4% for selling and 3% for buying, I bought cotton for him. What did I pay for the cotton? What was my commission for selling the wheat? for buying the cotton?

9. What is the interest on a three and a half per cent U. S. bond of $5000 from July 1 to February 18? (Accurate interest.)

10. I invested $4500 at 4½%, from which I received $214.96. How long was it invested?

11. A owes B $1000, to be paid October 1. What must be the face of a note, dated July 1 and bearing interest at 5%, to exactly cancel the debt?

12. A note due in 4 months without interest was discounted at a bank, the sum of $97.95 being paid. For what sum was the note drawn? (Rate of discount 6%.)

1. For what sum must a note be drawn, payable in 3 months without interest, that the avails at a bank may be $400 when the discount rate is 6% ?

2. What must be the face of a note given for 60 days without interest that the avails at a bank may be $700, discount being 6% ?

3. A bank, in discounting at date a 90-days' note, paid $3938. What was the face of the note, discount being 6% ?

4. I bought a house for a certain sum, and after paying 1½% of the cost for repairs and ¾% of cost for insurance, I sold it for $4908, which exactly covered the cost of repairs and insurance. What was the cost ?

5. If 280 workmen in a shoe factory can now make by machinery as many shoes as 1400 workmen formerly could by hand-labor alone, what per cent of hand-labor is displaced by the use of machinery ?

6. The rate of taxation in a certain town is 14.8 mills on a dollar. What is Mr. George Brown's tax, whose property is valued at $6250 ?

7. A town whose valuation is $1,500,000 is to raise $15,000 for expenses. There are 240 polls, each taxed $2. Allowing 2% on the sum collected for collecting the tax, and assuming that the entire sum assessed will be collected, what should be the rate of taxation ?

8. A man bought a farm for $6500, paying $1500, and agreeing to pay the balance in four annual installments. What was each annual payment, interest being 6% ?

9. A boy 10 years of age received a legacy as follows : $3000 to be paid when he is 15 years of age, $3000 when he is 18, and $4000 when he is 21. If present payment is made to his guardian by the executor, what sum ought to be paid, money being worth 6% ?

10. $1797 was paid at auction for 16 shares of bank stock. What was the price per share ? The price paid for this stock per share was ¼ of one per cent less than 50% premium. What was the par value ? What would this stock net the investor at the price paid, the regular dividends being 8% ?

1. A demand note of \$1555, dated Nov. 17, 1892, at 6% interest, has had the following payments made: Dec. 1, \$555; Dec. 10, \$332; Dec. 30, \$200; Jan. 10, 468. How much interest was due Jan. 10, when the note was paid in full?

2. Another demand note for \$4512, dated Nov. 22, 1892, at 7% interest, has paid on it, Dec. 5, \$721; Dec. 9, \$758; Dec. 23, \$758; Dec. 27, \$1517; Jan. 10, \$759. How much interest is due Jan. 10?

3. Find the cost of 13,345 bricks at \$8.25 a thousand.

4. How many hundred pounds in .25 of a ton?

5. Find the cost of slating a roof 60 ft. 9 in. long and 42 ft. wide at \$1.75 per square yard.

6. What was Brown & Bowman's loss on .15 of \$1200 worth of goods, if .33⅓ of the goods were destroyed by fire?

7. Sold 3 loads of corn weighing 2340 lb. each at \$.85 a bushel. How much did I receive? (Reckon 56 lb. to the bushel.)

8. A bin 20 ft. long, 8 ft. wide, and 3 ft. 9 in. deep is full of wheat. What is it worth at 80¢ a bushel? (1 bu. = 60 lb.)

9. A certain court contains 60 sq. yd. How many stones 9 in. square will be required to pave it?

10. A can do a piece of work in 5 days, and B in 6. In how long a time can both do it?

11. How many yards of Brussels carpeting 27 in. wide will cover a floor 24 ft. long, 17 ft. 4 in. wide, if strips run lengthwise, and 6 in. are allowed on each strip for matching? What will it cost at \$1.87½ per yard?

12. A certain township contains 243,200 acres. How many square miles in the town?

13. If light travels 186,000 miles a second, how long would it take to traverse the space between the earth and sun, a distance of 92,000,000 miles? How long in going around the earth, a distance of 24,899 miles?

14. A merchant having 245 yd. of cloth sold ⅔ of it at one time, ⅛ at another, and sold the remainder at \$1.33½ a yard. Find the value of the remainder.

1. Bought $27\frac{1}{2}$ barrels of sugar for $\$298\frac{1}{2}$, and sold at a gain of $\$4.87\frac{1}{2}$ per barrel. At what price was it sold?

2. How many tiles 4 inches square will be needed to lay a floor 52 ft. by 12 ft.? How many tiles 10^{cm} square for a floor 6.5^{m} by 4.6^{m}?

3. Bought 580 lb. of raisins at $12\frac{1}{2}¢$ per pound, and found that 5% of them were poor. What was my loss?

4. At $48¢$ per cubic yard, what will be the cost of removing an embankment 256 ft. long, 50 ft. wide, and $6\frac{1}{3}$ ft. high?

5. If a merchant sold \$9755 worth of spring goods at a gain of 20%, what are his profits, after deducting \$512.75 for expenses?

6. A grocer bought three kinds of tea — some at $58¢$, some at $75¢$, and some at $95¢$. What was the average price per pound?

7. If a young man receives \$20 per week salary, pays \$7.50 for board, \$4.25 for other expenses, how long will it take him to save \$450 for a year at college?

8. The floor of a room 14 ft. 6 in. long and 12 ft. 8 in wide is to be covered with a carpet 27 in. wide. At $62\frac{1}{2}¢$ a yard, what will the carpet cost, supposing it to be laid in such a way as to make the least waste by cutting or turning under?

9. I have a rectangular lot of land 185 ft. wide which contains $\frac{3}{4}$ A. It has a fence inclosing it 4 ft. 6 in. high, and a gravel walk in its border 3 ft. 6 in. wide. It also has a gravel walk extending lengthwise across the middle of the lot 2 ft. 6 in. wide, and a walk of the same width extending breadthwise across the middle of the lot. (*a*) What did the lot cost, at the rate of $7\frac{1}{2}¢$ a square foot? (*b*) How many cubic yards of gravel did I have to use in making the walks, if the gravel was spread 2 in. thick? (*c*) What did it cost to make the walks, at $5¢$ a square foot? (*d*) What did it cost to make the fence, at $15¢$ a running yard? (*e*) What did the boards of the fence cost at \$18 per M.? (*f*) If I sow with grass-seed all the surface of the lot outside of the walks, how much seed will it take at the rate of 3 bushels to the acre?

10. How many gallons of water will a cylindrical tank hold that is 12 ft. high and 6 ft. in diameter? How much will it cost to cement the inside of it at $20¢$ a square foot?

1. How many cubic yards of loam will it take to cover a quarter of an acre of land 2 in. thick?

2. How many yards of carpeting 30 in. wide will it take to cover a floor 12 ft. square? Allow for waste in laying.

3. If 30 cubic feet of air are required for each pupil every minute, how many cubic feet will be required for 40 pupils during an hour's time? How long must a closed school-room 25 ft. wide and 12 ft. high be to contain a sufficient amount of good air for 20 pupils? Give a similar problem, using the metric system.

4. The measured thickness of 5 sheets of paper is .44^{mm}. An unknown number of sheets measures 2.19^{mm} in thickness. How many sheets are there? How high a pile would 10 reams make?

5. A piece of copper wire 17.6^{cm} long weighs 420^{mg}. A piece of the same wire so twisted that its length cannot be measured weighs 6.9^{g}. How long is it? If copper is 8.78 times as heavy as an equal bulk of water, what is the diameter of the wire?

6. In the Fahrenheit thermometer the freezing point is 32° and the boiling point is 212°. In the Centigrade the freezing point is zero and the boiling point is 100°. 1° C. equals how many degrees Fahrenheit? 1° F. equals how many degrees Centigrade? What degree Centigrade corresponds to 42° F.? to 77° F.? What degree Fahrenheit corresponds to 20° C.? to 35° C.?

7. The temperature of the blood is about 100° F. What is it Centigrade?

8. A school-room should be 68° F. How many degrees Centigrade?

9. A floating body displaces its own weight of water. If a cubic foot of water weighs 62½ lb., how many cubic feet of water will be displaced by a ship and cargo weighing 1200 tons? weighing 16,000 tons?

10. A vessel has the shape of the frustum of a cone 4 in. high, and the diameters of the bases are 8 in. and 6 in. How many gallons of water will it hold?

11. A pan in the form of a frustum of a cone is 14 in. in diameter at the bottom, and 9 in. in diameter at the top, and is 5½ in. high. How many quarts of berries will it hold?

1. The interval between seeing a blow struck by an axe and hearing the sound of the blow was $\frac{1}{2}$ second. How far away was it?

2. How long does it take the sound of a church bell $2\frac{1}{2}$ miles away to strike the ear of a listener?

3. The moon's average distance from the earth is 238,840 miles. How long does it take light from the moon to reach the earth?

4. The light which we shall receive to-night from one of the fixed stars started on its journey over 3000 years ago. Calculate its distance from the earth.

5. In the lever, the power multiplied by its distance from the fulcrum equals the weight multiplied by its distance from the fulcrum. If the fulcrum is in the middle, a power of 10 lb. at one end will raise how many pounds at the other?

6. The long arm of a lever is twice the length of the short arm. A power of 10 lb. at the end of the long arm will lift how much at the end of the short arm?

7. A workman is using a six-foot iron bar. He places it so that the short arm is 4 inches long. If he bears down with a force of 200 lb., how many pounds can he raise? How many if he makes the short arm only two inches?

8. The power is 20 lb., the weight raised is 50 lb. Find the relative length of the two arms of the lever.

9. The radius of a large wheel is 16 inches, the radius of a small wheel 3 inches. One pound at the circumference of the large wheel will exert a power of how many pounds at the circumference of the small wheel?

10. In lifting an anchor which weighs 1000 lb., four men work a capstan having a radius of 2 ft. by bars, the outer ends of which are 6 ft. from the centre of the capstan. How much force does each man exert?

11. A man and a boy support between them on a pole 3 yards long a weight of 100 lb. Where should the weight be placed so that the boy may support 20 lb.?

12. Make problems similar to problems on this page, using the metric system.

Measures of Length.

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
5½ yards = 1 rod (rd.)
320 rods = 1 mile (mi.)

7.92 inches = 1 link (li.)
100 links = 1 chain (ch.)
80 chains = 1 mile.

6 feet = 1 fathom.
120 fathoms = 1 cable length.
6086 feet = 1 knot.
3 knots = 1 league.

60 seconds (″) = 1 minute (′)
60 minutes = 1 degree (°)
360 degrees = 1 circumference.
69⅛ miles = 1° of longitude on equator or of latitude on a meridian.

Measures of Surface.

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30¼ square yards *or* 272¼ square feet = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
10 square chains = 1 acre.
640 acres = 1 square mile.
1 mile square = 1 section of land.
36 square miles = 1 township.
100 square feet = 1 square of flooring or roofing.

Measures of Volume.

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
24¾ cubic feet = 1 perch.
16 cubic feet = 1 cord foot (cd. ft.)
128 cubic feet = 1 cord (cd.)

Measures of Capacity.

Liquid Measure.

4 gills (gi.) = 1 pint (pt.)
2 pints (pt.) = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
1 gallon contains 231 cubic inches.

Dry Measure.

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)
1 bushel contains 2150.4 cubic inches.

Apothecaries' Measure.

60 drops *or* minims (gtt. *or* ♏) = 1 fluid dram (ƒ℥)
8 fluid drams = 1 fluid ounce (ƒ℥)
16 fluid ounces = 1 pint (O)
8 pints = 1 gallon (Cong.)

Measures of Weight.

Avoirdupois Weight.

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds *or* 20 hundredweight = 1 ton (T.)
1 pound = 7000 grains.

Troy Weight.

24 grains (gr.) = 1 pennyweight (pwt.)
20 pennyweights = 1 ounce (oz.)
12 ounces = 1 pound (lb.)
1 pound = 5760 grains.

Apothecaries' Weight.

20 grains (gr.) = 1 scruple (sc. *or* ℈)
3 scruples = 1 dram (dr. *or* ʒ)
8 drams = 1 ounce (oz. *or* ℥)
12 ounces = 1 pound (lb. *or* ℔)
1 pound = 5760 grains.

Measures of Time.

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (h.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
30 days *or* 31 days = 1 month (mo.)
365 days / 12 months / 52 weeks 1 day = 1 year (yr.)
366 days = 1 leap year.
100 years = 1 century (C.)

Miscellaneous.

24 sheets = 1 quire (qr.)
20 quires = 1 ream (rm.)
10 reams = 1 bale.
12 units = 1 dozen (doz.)
12 dozen = 1 gross (gr.)
12 gross = 1 great gross (G. gr.)
20 units = 1 score.

Measures of Value.

United States Money.

10 mills (m.) = 1 cent (ct., c., or ¢)
10 cents = 1 dime (d.)
10 dimes (100 cents) = 1 dollar ($)
10 dollars = 1 eagle.

English Money.

4 farthings (far.) = 1 penny (*d.*)
12 pence = 1 shilling (*s.*)
20 shillings = 1 pound (£)=$4.866.

French Money.

100 centimes (ct.)=1 franc (fr.)=$.193

German Money.

100 pfennigs (pf.)=1 Mark (M.)=$.238

Italian Money.

100 centimes (ct.)= 1 lira (li.) = $.193

Russian Money.

100 copecks = 1 rouble (rb.) = $.772

Austrian Money.

100 kreutzers (kr.)=1 florin (fl.)=$.453

METRIC SYSTEM

Linear Measure.

10 millimeters (mm)= 1 *centimeter* (cm)
10 centimeters = 1 decimeter (dm)
10 decimeters = 1 METER (m)
10 meters = 1 dekameter (Dm)
10 dekameters = 1 hektometer (Hm)
10 hektometers = 1 *kilometer* (Km)

Square Measure.

100 square millimeters (q mm) = 1 square centimeter (q cm)
100 square centimeters = 1 square decimeter (q dm)
100 square decimeters = 1 square meter (qm), or centar (ca)
100 square meters = 1 square dekameter (q Dm), or ar (a)
100 square dekameters = 1 square hektometer (q Hm), or hektar (Ha)
100 square hektometers = 1 square kilometer (q Km)

Cubic Measure.

1000 cubic millimeters (cu mm) = 1 cubic centimeter (cu cm)
1000 cubic centimeters = 1 cubic decimeter (cu dm)
1000 cubic decimeters = 1 cubic meter (cu m)

Measures of Capacity.

1 milliliter (ml) = 1 cubic centimeter.
10 milliliters = 1 centiliter (cl)
10 centiliters = 1 deciliter (dl)
10 deciliters = 1 LITER (l) = 1 cubic decimeter.
10 liters = 1 dekaliter (Dl)
10 dekaliters = 1 hektoliter (Hl)
10 hektoliters = 1 kiloliter (Kl) = 1 cubic meter.

Measures of Weight.

10 milligrams (mg)= 1 centigram (cg)
10 centigrams = 1 decigram (dg)
10 decigrams = 1 GRAM (g)
10 grams = 1 dekagram (Dg)
10 dekagrams = 1 hektogram (Hg)
10 hektograms = 1 *kilogram*, or *kilo* (K)
1000 kilograms = 1 *ton* (T)